সূচিপত্র:

বিষয়ের নাম: বাংলা
পূর্ণমান : ২০

	মান বণ্টন
ভাষা : প্রয়োগ-অপপ্রয়োগ, বানান ও বাক্য শুদ্ধি, পরিভাষা, সমার্থক ও বিপরীতার্থক শব্দ, ধ্বনি, বর্ণ, শব্দ, পদ, বাক্য, প্রত্যয়, সন্ধি ও সমাস	**১৫**
সাহিত্য : ক. প্রাচীন ও মধ্যযুগ খ. আধুনিক যুগ (১৮০০-বর্তমান পর্যন্ত)	**০৫**

Name of the Subject: English

Total Marks: 20

	Marks Distribution
PART- I : Language	15

A. Parts of Speech:

The Noun:
- The Determiner
- The Gender
- The Number

The Pronoun

The Verb:
- The Finite: transitive, intransitive
- The Non-finite: participles, infinitives, gerund
- The Linking Verb
- The Phrasal Verb
- Modals

The Adjective

The Adverb

The Preposition

The Conjunction

B. Idioms & Phrases:

Meanings of Phrases

Kinds of Phrases

Identifying Phrases

C. Clauses:

The Principal Clause

The Subordinate Clause:
- The Noun Clause
- The Adjective Clause
- The Adverbial Clause & its types

D. Corrections:
- The Tense
- The Verb
- The Preposition
- The Determiner
- The Gender
- The Number
- Subject-Verb Agreement

E. Sentences & Transformations:

The Simple Sentence

The Compound Sentence

The Complex Sentence

The Active Voice

The Passive Voice

The Positive Degree
The Comparative Degree
The Superlative Degree

F. Words:

Meanings
Synonyms
Antonyms
Spellings
Usage of words as various parts of speech
Formation of new words by adding prefixes and suffixes

G. Composition:

Names of parts of paragraphs/letters/applications

PART- II: Literature 05

H. English Literature:

Names of writers of literary pieces from Elizabethan period to the 21st Century.

Important drama, Poetry and prose of different ages.

বিষয়ের নাম: বাংলাদেশ বিষয়াবলি
পূর্ণমান : ২০

	মান বণ্টন
১. বাংলাদেশের জাতীয় বিষয়াবলি : বাংলাদেশের আর্থসামাজিক ও রাজনৈতিক ইতিহাস: আধুনিক যুগ (১৭৫৭ থেকে অদ্যবধি)	০৪
২. বাংলাদেশের কৃষিজ সম্পদ : শস্য উৎপাদন এবং এর বহুমুখীকরণ, খাদ্য উৎপাদন ও ব্যবস্থাপনা।	০২
৩. বাংলাদেশের জনসংখ্যা, জনশুমারি, জাতি, গোষ্ঠী ও ক্ষুদ্র নৃগোষ্ঠী সংক্রান্ত বিষয়াদি।	০২
৪. বাংলাদেশের অর্থনীতি : উন্নয়ন পরিকল্পনা প্রেক্ষিত, জাতীয় আয়-ব্যয়, রাজনীতি ও বার্ষিক উন্নয়ন কর্মসূচি, দারিদ্র্য বিমোচন ইত্যাদি।	০২
৫. বাংলাদেশের শিল্প ও বাণিজ্য : শিল্প উৎপাদন, পণ্য আমদানি ও রপ্তানিকরণ, গার্মেন্টস শিল্প ও এর সার্বিক ব্যবস্থাপনা, অন্যান্য শিল্পসমূহ, বৈদেশিক লেন-দেন, অর্থ প্রেরণ, ব্যাংক ও বীমা ব্যবস্থাপনা ইত্যাদি।	০২
৬. বাংলাদেশের সংবিধান : প্রস্তাবনা ও বৈশিষ্ট্য, মৌলিক অধিকারসহ রাষ্ট্র পরিচালনার মূলনীতিসমূহ, সংবিধানের সংশোধনীসমূহ।	০২
৭. বাংলাদেশের রাজনৈতিক ব্যবস্থা : রাজনৈতিক দলসমূহের গঠন, ভূমিকা ও কার্যক্রম, ক্ষমতাসীন ও বিরোধী দলের পারস্পরিক সম্পর্কাদি, সুশীল সমাজ ও চাপ সৃষ্টিকারী গোষ্ঠীসমূহ এবং এদের ভূমিকা। জুলাই-আগস্ট গণঅভ্যুত্থান ২০২৪ পরবর্তী এবং সংস্কার প্রস্তাবনা।	০২
৮. বাংলাদেশের সরকার ব্যবস্থা : আইন, শাসন ও বিচার বিভাগসমূহ, আইন প্রণয়ন, নীতি নির্ধারণ, জাতীয় ও স্থানীয় পর্যায়ের প্রশাসনিক ব্যবস্থাপনা কাঠামো, প্রশাসনিক পুনর্বিন্যাস ও সংস্কার।	০২
৯. বাংলাদেশের জাতীয় অর্জন, বিশিষ্ট ব্যক্তিত্ব, গুরুত্বপূর্ণ প্রতিষ্ঠানসমূহ, জাতীয় পুরস্কার, বাংলাদেশের খেলাধুলাসহ চলচ্চিত্র, গণমাধ্যম-সংশ্লিষ্ট বিষয়াদি।	০২

বিষয়ের নাম: আন্তর্জাতিক বিষয়াবলি
পূর্ণমান : ২০

		মান বণ্টন
১.	বৈশ্বিক ইতিহাস, আঞ্চলিক ও আন্তর্জাতিক ব্যবস্থা, ভূ-রাজনীতি।	০৪
২.	আন্তর্জাতিক নিরাপত্তা ও আন্তরাষ্ট্রীয় ক্ষমতা সম্পর্ক।	০৪
৩.	বিশ্বের সাম্প্রতিক ও চলমান ঘটনাপ্রবাহ।	০৪
৪.	আন্তর্জাতিক পরিবেশগত ইস্যু ও কূটনীতি।	০৩
৫.	আন্তর্জাতিক সংগঠনসমূহ এবং বৈশ্বিক অর্থনৈতিক প্রতিষ্ঠানাদি।	০৩
৬.	সিভিল সার্ভিসের গোড়াপত্তন এবং যুক্তরাজ্য, যুক্তরাষ্ট্র, চীন, জাপান, ভারত, নেপাল, শ্রীলংকা ও পাকিস্তান সিভিল সার্ভিস	০২

বিষয়ের নাম: গাণিতিক যুক্তি
পূর্ণমান : ১০

		মান বণ্টন
১.	বাস্তব সংখ্যা, ল.সা.গু, গ.সা.গু, শতকরা, সরল ও যৌগিক মুনাফা, অনুপাত ও সমানুপাত, লাভ ও ক্ষতি ।	০২
২.	বীজগাণিতিক সূত্রাবলি, বহুপদী উৎপাদক, সরল ও দ্বিপদী সমীকরণ, সরল ও দ্বিপদী অসমতা, সরল সহসমীকরণ ।	০২
৩.	সূচক ও লগারিদম, সমান্তর ও গুণোত্তর অনুক্রম ও ধারা ।	০২
৪.	রেখা, কোণ, ত্রিভুজ ও চতুর্ভুজ সংক্রান্ত উপপাদ্য, পিথাগোরাসের উপপাদ্য, বৃত্ত সংক্রান্ত উপপাদ্য, পরিমিতি-সরলক্ষেত্র ও ঘনবস্তু ।	০২
৫.	সেট, বিন্যাস ও সমাবেশ, পরিসংখ্যান ও সম্ভাব্যতা ।	০২

বিষয়ের নাম: মানসিক দক্ষতা

(MENTAL ABILITY)

পূর্ণমান : ১০

১. ভাষাগত যৌক্তিক বিচার (Verbal Reasoning)
২. সমস্যা সমাধান (Problem Solving)
৩. বানান ও ভাষা (Spelling and Language)
৪. যান্ত্রিক দক্ষতা (Mechanical Reasoning)
৫. স্থানাঙ্ক সম্পর্ক (Space Relation)
৬. সংখ্যাগত ক্ষমতা (Numerical Ability)

বাংলা ভাষা ও সাহিত্য
(পদ-সংশ্লিষ্ট)
বিষয় কোড: ১১১

পূর্ণমান-১০০

পার্ট- I

মান-৫০

(ক) বাংলা সাহিত্যের পরিচয়: প্রাচীন ও মধ্যযুগ ২৫ নম্বর

চর্যাপদ, বড়–চন্ডীদাস, শাহ্ মুহম্মদ সগীর, মঙ্গলকাব্য, বৈষ্ণব পদাবলী, আরাকান রাজসভা, সৈয়দ সুলতান, কৃত্তিবাস, দৌলত উজির বাহরাম খান, মুকুন্দরাম চক্রবর্তী, কাশীরাম দাস, আলাওল, আবদুল হাকিম, ভারতচন্দ্র রায়গুণাকর, শাহ্ মুহম্মদ গরীবুল্লা, আরাকান রাজসভা কেন্দ্রিক বাংলা সাহিত্য, ময়মনসিংহ গীতিকা।

(খ) বাংলা সাহিত্যের পরিচয়ঃ আধুনিক যুগ ২৫ নম্বর

ঈশ্বরচন্দ্র গুপ্ত, ঈশ্বরচন্দ্র বিদ্যাসাগর, মধুসূদন দত্ত, বঙ্কিমচন্দ্র চট্টোপাধ্যায়, মীর মশাররফ হোসেন, কায়কোবাদ, রবীন্দ্রনাথ ঠাকুর, প্রমথ চৌধুরী, শরৎচন্দ্র চট্টোপাধ্যায়, নজিবর রহমান সাহিত্যরত্ন, জীবনানন্দ দাস, কাজী নজরুল ইসলাম, ফররুখ আহমদ, জসীম উদ্দীন।

বাংলা ভাষা ও সাহিত্য

পার্ট- I I

মান-৫০

(ক) কাব্য: **১০ নম্বর**

মাইকেল মধুসূদন দত্ত, বিহারী লাল চক্রবর্তী, কায়কোবাদ, রবীন্দ্রনাথ ঠাকুর, কাজী নজরুল ইসলাম, জীবনানন্দ দাস, জসিম উদ্দীন।

(খ) গদ্য: **১০ নম্বর**

ঈশ্বরচন্দ্র বিদ্যাসাগর, বঙ্কিমচন্দ্র চট্টোপাধ্যায়, শরৎ চন্দ্র চট্টোপাধ্যায়, মীর মশাররফ হোসেন, প্রমথ চৌধুরী।

(গ) নাটক: **১০ নম্বর**

দীনবন্ধু মিত্র, মীর মশাররফ হোসেন, রবীন্দ্রনাথ ঠাকুর।

(ঘ) ব্যাকরণ: **১০ নম্বর**

যুক্তাক্ষর গঠন, ণ-ত্ব ও ষ-ত্ব বিধান, প্রমিত বানানের নিয়ম (বাংলা একাডেমী প্রণীত), বাক্যগঠন, বাংলা বাক্য গঠনে ইংরেজি রীতির প্রভাব, বাক্য ও বানানের শুদ্ধাশুদ্ধি, চলতি রীতির নিয়মাবলী, বাংলা ভাষার শব্দসম্ভার, শব্দগঠনের বৈশিষ্ট্য, সমার্থক ও বিপরীতার্থক শব্দ, শব্দের বানান ও উচ্চারণ।

(ঙ) অনুচ্ছেদ রচনা **৫ নম্বর**

(চ) সাধু, চলিত ও আঞ্চলিক ভাষারীতি **৫ নম্বর**

ENGLISH
(POST RELATED)
Subject Code: 121
Total Marks-100

Part-I
Marks: 50
(Shakespeare to Romantic Period)

Group A - Marks 25
Shakespeare: "Hamlet", "King Lear', "Macbeth", "Othello", 'The Tempest".

Group B – Marks 25

John Milton	: "Paradise Lost", Book IX and X
Jonathan Swift	: "Gulliver's Travels"
William Wordsworth	: "Tintern Abbey"," Ode: Intimations of Immortality"
Samuel Taylor Coleridge	:" The Rime of the Ancient Mariner","Kubla Khan", " Dejection: an Ode"
Percy Bysshe Shelley	:"Ode to the West Wind", "To a Skylark"
John Keats	: Odes
Jane Austen	: "Pride and Prejudice"

ENGLISH
Part-II
Marks: 50

(Victorian to Modern Period)

Group A - Marks 25

Alfred Tennyson (selections)	: "Ulysses", " The Lotos Eaters", "Tithonus", " In Memoriam"
Robert Browning	: "Andrea del Sarto" " Fra Lippo Lippi" "My Last Duchess", " Rabbi Ben Ezra"
Matthew Arnold	: "Dover Beach", " The Scholar Gipsy", " Thyrsis"
Charles Dickens	: Great Expectations
Thomas Hardy	: Tess of the D'Urbarvilles

Group B - Marks 25

William Butler Yeats	: Selections
T.S.Eliot	: "The Love Song of J. Alfred Prufrock", "The Waste Land"
D. H. Lawrence	: "Sons and Lovers"
Joseph Conrad	: "Heart of Darkness"
Arthur Miller	: "Death of a Salesman"
Samuel Beckett	: "Waiting for Godot"

সংস্কৃত (পদ-সংশ্লিষ্ট)
বিষয় কোড: ১৫১
পূর্ণমান-১০০

পার্ট- I
মান-৫০

(সংস্কৃত সাহিত্যের ইতিহাস, দার্শনিক কাব্য, ছন্দ ও অনুবাদ)

(ক)	সংস্কৃত সাহিত্যের ইতিহাস	.....	২৫ নম্বর
(খ)	দার্শনিক কাব্য (গীতা-সম্পূর্ণ)	.....	১০ নম্বর
(গ)	ছন্দ (ইন্দ্রবজ্রা, উপেন্দ্রবজ্রা, বিদ্যুন্মালা, শিখরিণী, মালিনী, বসন্ততিলক, রথোদ্ধতা, হরিণী, বংশস্থবিল, মন্দাক্রান্তা, রুচিরা, ভুজঙ্গপ্রয়াত, আর্যা, শালিনী, শার্দুল বিক্রীড়িত	.....	৫ নম্বর
(ঘ)	অনুবাদ (সংস্কৃত থেকে বাংলা বা ইংরেজি)	.....	১০ নম্বর

সংস্কৃত
পার্ট- I I
মান-৫০
(নাটক, পদ্যকাব্য, ব্যাকরণ ও অনুবাদ)

১।	নাটকঃ (ক) অভিজ্ঞানশকুন্তলম্ (খ) স্বপ্নবাসবদত্তম্	.....	১৫ নম্বর
২।	পদ্যঃ (ক) মেঘদূতম্ (সম্পূর্ণ) (খ) কিরাতার্জুনীয়ম্ (১ম সর্গ)	.....	১৫ নম্বর
৩।	ব্যাকরণঃ সন্ধি, কারক ও বিভক্তি, সমাস, অব্যয়, স্ত্রীপ্রত্যয়, আতমনেপদ ও পরস্মৈপদবিধান, কৃৎ ও তদ্ধিত প্রত্যয়, ণ-ত্ব ও ষ-ত্ব বিধান	.....	১০ নম্বর
৪।	অনুবাদঃ (বাংলা বা ইংরেজি থেকে সংস্কৃত ভাষায় অনুবাদ)	.....	১০ নম্বর

PSYCHOLOGY

(POST RELATED)
Subject Code: 171
Total Marks-100

Part-I
(General and Developmental Psychology)
Marks: 50

A—General Psychology 25

1. Definition and subject matter of Psychology; Fields of Psychology; Research Methods: Observation, Survey, Experimental method, Case study.

2. Psychological basis of Behavior	:	Structure and functions of Central and Peripheral nervous system Endocrine glands and their effects on behavior;
3. Sensation and Perception	:	Definition of Sensation and Perception; Visual and auditory sense. Thresholds and their measurement. Perceptual organization Depth perception Illusion and hallucinations
4. Motivation and Emotion	:	Definition of Motivation and Emotion; Physiological and Social motives; Theories of Motivation, Development of Emotions Bodily charges in Emotion; Theories of Emotion.
5. Learning and Memory	:	Definition of Learning. Factor of Learning. Classical Conditioning and Operant Conditioning; Observational Learning, Perceptual Learning. The process of Memory; Sensory Memory, Short-term Memory and Long term Memory, Forgetting and its causes!
6. Cognition and Intelligence	:	Definition of Thinking, Concept formation, Problem solving; Creative Thinking. Cognitive development; Definition of Intelligence; Measurement of Intelligence-Standford-Binet and Wachslet's- Intelligence Scales.
7. Personality	:	Definition of Personality. Development of Personality-Psychoanalytic and Behavioral approaches. Assessment of personality.

B—Developmental Psychology 25

8. Development Psychology	:	Definition of Developmental Psychology. Division of the Life Cycle, Principles of Development. Methods used in studying Development.
9. Beginning of Life	:	Conception, Prenatal development, Stages of and Factors affecting prenatal development.

10. The Birth	:	Birth process, Types of birth and its effect on Development.
11. The Neonate	:	Physiological functioning. Reflex actions.
12. Infancy	:	Physical, Language, Social and Emotional Development.
13. Childhood	:	Physical, Language, Social and Emotional Development.
14. Adolescence	:	Physical changes. Causes and psychological effects of physical change, Problems of adolescence: Juvenile delinquency, Drug addiction, Suicide.

PSYCHOLOGY

Part-II

(Social and Abnormal Psychology)

Marks: 50

A.	**Social Psychology:**		**25**
1.	Social Psychology	:	Definition and subject matter of Social Psychology and its relation to other Social Sciences, Methods used in studying social behaviour,
2.	Socialization	:	Its processes and products, Agents of socialization, Family, Schools and Neighburs, Cultural influences on bahaviour,
3.	Attitudes	:	Definition of Attitude; Components of Attitude; Opinions and values. Formation of attitudes; Attitude change: Cognitive theories;
4.	Groups	:	Types of group. Group cohesiveness.
5.	Leadership	:	Definition of leadership; Approaches to the study of leadership: Trait approach, type approach and situational approach. Functions of leader; Characteristics of leader; Effective leadership.
6.	Mass Communication and Collective behaviour	:	Public opinion-formation and assessment of public opinion. Propaganda-Techniques and principle of propaganda. Rumour and Prejudice, Abnormal Psychology,
B.	**Abnormal Psychology:**		**25**
7.	Abnormal Psychology	:	The concept of normality and abnormality in behaviour. Relation of Abnormal Psychology with Clinical psychology, Psychiatry and Mental health.
8.	Causes of Abnormal Behaviour	:	Biological, psychological and socio-cultural causal factors of abnormal behaviour.
9.	Anxiety-based disorder	:	Generalized anxiety disorder, Phobias, Obsessive- Compulsive disorder.

10. Somatoform and Dissociative Disorder	:	Conversion disorder, Hypochondriasis.
11. Schizophrenia	:	Types and causal factors of schizophrenia.
12. Treatment of behaviour disorder	:	Psychoanalytic therapy, Client-centered therapy and Behaviour therapy.

HISTORY

(POST RELATED)
Subject Code: 181
Total Marks-100

Part-I

Marks-50
History of Bangladesh
(From earliest times to 1971 A.D)

Group-I: Ancient **10**

a. Maurya and Gupta rule in Bengal
b. Sasanka
c. Pala rule in Bengal: Rise of the Palas; Dharmapala; Devapala; Mahipala I; Samantra Rebellion during the reign of Mahipala II; Ramapala; glories of Palas
d. Dynasties of South-Eastern Bengal: the Devas; the Chandras; the Varmans
e. Sena rule in Bengal: VijayaSena; VallalaSena; LaksmanaSena; Glories of the Senas.

Group-II: Medieval **20**

a. Coming of the Muslims: Bakhtiyar Khalji: Ghitasuddin Iwaz Khalji
b. Cricumstaces leading to the independence of Bengal
c. Independent Sultannate: Shamsuddin IIiyas Shah; Ghiyasuddin Azam Shah; Alauddin Hussain Shah; Glories of the Hussain Shahi Period.
d. Foreigh Accounts on Bengal: Ibn Barutah; Ma-Huan
e. Prtuguese in Bengal
f. Mughal occupation of Bengal and the Bara Bhuiyas;
g. Mughal Subahdars:Shaista khan; Mir Jumla; Murshid Quli Khan
h. Bengal under the Nawabs: Alivardi Khan; Sirajuddaula

Group-III: Modern **20**

a. Coming of the English: Battle of Plassey; Battle of Buxar; Crant of Diwani to the East India Company
b. The Permanent Settlement
c. Early Resistance Movements against the British: Fakir-Sannyasi movement; Titumir
d. Reform Movements: the Faraizi Movement; Rammohan Ray
e. Partition of Bengal, 1905; Swadeshi and Non-Cooperation Movement
f. Bengal Politics, 1937-1946; Lahore Resolution; Partition of 1947
g. 1952 Language Movement and the Election of 1956
h. Disparity between the two wings of Pakistan
i. The demand for autonomy of East Pakistan; Six-Point Programme
j. Eleven Point Movement of 1969
k. Election of 1970 and its aftermath
l. The War of Liberation and the emergence of Bangladesh

HISTORY

Part-II
Marks-50

Part-A

Marks-25

History of the Indian Subcontinent, 1206-1947
(Selected topics)

Group-I: Sultanate Period

a. Coming of the Muslims: invasion of Sindh; invasion of Sultan Mahmud of Ghazni; Ghoride invasion
b. Sultans: Iltutmish; Ghiyasuddin Balban; Alauddin Khalji; Muhammad bin Tughlaq

Group-II: Mughal period

a. Battle of Panipath and the foundation of Mughal rule; Badur
b. Humayun's struggle with Sher Shah; Sher Shah's Reforms
c. Akbar: Conquests, Revenue Reforms , Rajput Policy, Religious Policy: Mansabdari System
d. Art and Architecture under Shahjahan; War of Succession
e. Aurangzeb: Deccan Policy; Decline of Mughal Rule

Group-III: British period

a. Battle of Plassey; Battle of Buxar and the Grant of the Diwani
b. Consolidation of British rule: Warren Hastings; Cornwallis
c. Expansion of British Rule: Wellesley; Dalhousi
d. Social & Administrative Reforms: Ripon; Bentinck
e. War of 1857
f. Growth of Nationalism: Indian National Congress and the Muslim League; Partition of Bengal of 1905 and its aftermath; Swadeshi and Khilafat Movements; Act 1935; Lahore Resolution, 1940.
g. Partition of 1947

Part –B

Marks-25
History of Europe, 1453 1945
(Selected Topics)

Group-I

a. Geographical Discoveries; Impact on the subsequent course of history
b. Martin Luther and Protestant Reformation
c. Counter Reformation
d. Benevolent Despots: Frederick; Peter; Catherine II; Joseph II
e. Absolute Monarchy: Louis XIV of France

Group-II

a. French Revolution: background and cause; role of the philosophers
b. Napoleon: rise and conquests; reforms; fall of Napoleon
c. congress of Vienna and Metternich
d. French Revolutions of 1830 and 1848
e. Unification of Germany
f. Unification of Italy
g. The Eastern Question; the Crimean War; the Berlin Congress

h. World War I: background and causes; results; Versailles Treaty
i. Rise of Socialism in Europe: the Bolshevik Revolution
j. Rise of Hitler in Germany and Mussolini in Italy
k. World War II: Background and cause; the Allied and Axis Powers; American involvement
l. Yalta Conference; Potsdam Declaration
m. The establishment of the UNO

ISLAMIC HISTORY & CULTURE

(POST RELATED)
Subject Code: 191
Total Marks-100

Part-I

Marks-50

(a) Pre-Islamic Arabia
The Ayyam Al-Arab; the Social, Political, Economic and Religious Aspects of the Arabs' Life; Trade and Trade Routes; Geophysical Environs.

(b) The Prophet Muhammad(Sm) 632 A.C.
Important events of the Makkah life of the Prophet with reference to the backdrop of his receiving the prophetic call in the cave of Hira, to the oath of al-Aqabah and the hijrat or migration from Makkah to Madinah; the Madinite life with special emphasis on the Sanad or the Charter of Madinah and the foundation of state, the war policy, the Treaty of Hudaibiyah, the conquest of Makkah, the farewell pilgrimage sermon and the multidimensional reforms.

(c) The Khulafa Rashidun (the pious caliphs) 632-661 A.C.
Hazrat Abu Bakr-his election and services for the cause of Islam and the nascent state of Madinah; Hazrat Umar-the territorial expansion of the caliphate and the administrative policy; Hazrat Uthman-charges and civil disturbances; Hazart Ali-civil war, forces of disintegration and the end of the pious caliphate; the salient features of administration under the pious caliphs.

(d) The Umayyad dynasty 661-750 A.C.
The Umayyads: the Khilafat under Mu'awiyah; Abdul Malik and his consolidation and arabicization; Khilafat of al-Walid-expansion in the East and the West; the services of Hajjaj B. Yusuf; later Umayyad Khalifas with special reference to Umar b. Abdul Aziz; the Mawali and their role in the Abbasid Revolution; causes for the fall of the Umayyad Khilafat; outline of the administration under the Umayyads.

(e) The Abbasid dynasty 750-1258 A.C.
Factors leading to the foundation of the Abbasid dynasty; Al-Mansur-his policy of the consolidation and administration; al_Mahdi-the important events of his reign; Harun al-Rashid-his character and achievements; al-Amin and al-Mamun-civil war between the two brothers and its aftermath; the reign of al-Mutawakil and the forces of disintegration; the rise and fall of the Barmakides; early Abbasid caliphs' Byzantine policy; Turkish and Persian's ascendancy in the court and its results; the development of learning and culture under Harun al-Rashid and al-Mamun; the rise of the Buwaihids and Saljuqs with reference to their impacts on the Abbasid caliphate; causes for the decay and downfall of the Abbasid dynasty; sack of Baghdad by Halaku Khan in 1258 A.C. and its farreaching effects; social and intellectual life under the Abbasids.

(f) Religious beliefs and practices
Five pillars of Islam; al-Quran, al Hadith; the sources of Muslim law; four Sunni schools of law; the Shites; the Murjites; the Kharijites; the Mutazilites, the Asharites.

ISLAMIC HISTORY AND CULTURE

Part-II

Marks-50

a. Review of the sources for the study of the subject.

b. Pre-Muslim background of the land and people of India.

c. The Arab conquest of Sind-its effects; Sultan Mahmud's invasion of India and the later Ghaznavids; India on the eve of Muhammad Ghori's invasion; the battles of Tarain and the foundation of Muslim rule in India.

d. Qutubuddin Aibak-the Mamluk dynasty-its consolidation by Iltutmish; the successors of Iltutmish; Ghiyasuddin Balban and his policy of consolidation with special reference to the theory of kingship; the beginning of Mongol invasion.

e. The Khaljis: the foundation of the dynasty; Alauddin Khalji's conquests and price control system.

f. The Tughlags: Muhammad b. Tughlag's ambitious projects and their results; Firuz Shah Tughlaq's reforms and army organization.

Sayyids and Lodis: the forces of disintegration; the causes of the fall of Sultanate and the rise of the Mughals; Sher Shah Sur and his agrarian policy.

Society, learning, culture, history-writing and administration under the Sultanate of Delhi.

g. The foundation of Mughal Empire and its corresponding power, Zhairuddin Muhammad Babur-his struggle for power and the foundation of Mughal dynasty in India-character and achievements; Nasiruddin Humayun-his struggle with Sher Shah, exile and restoration of power; Jalauddin Muhammad Akbar-his approchement with the Rajputs, The religious policy and the promulgation of Din-i-Elahi Nuruddin Jahangir-his state policy, patronization of art and painting, the influence of Nurjahan in the court; Shihabuddin Shah Jahan-his administration and architectural development-war of succession among his sons; Muhiuddin Alamgir Aurangzib-his expansion of the empire-struggle with the Marahtas and Deccan policy-his revivalist and religious policy; the weak successors of the dynasty and the forces of disintegration; the causes for the decay and downfall of the dynasty; society, learning, culture and administration in Muhgal India.

h. Advent of the Europeans and struggle for power

English East India Company's ascendancy, the battles of Plassey and Buxar, the Grant of Diwani to the East India Company, Emperor Bahadur Shah Zafar and the Indian war of Independence, 1857; Banishment of Bahadur Shah and the end of the Mughal rule theoretically and practically.

ISLAMIC STUDIES

(POST RELATED)
Subject Code: 201
Total Marks-100

Part-I
Marks 50

Part - I **25**

Qur'anic Studies and Studies of Hadith:

(a) Qur'anic Studies, Textual Study of Surahs: al-Fath, al-Hujurat and an-Nur
  (i) Translation
  (ii) Critical questions

(b) Studies of Hadith: Kitab al-Iman (upto Bab al-Kabair), Kitab al-Ilm (pp.32/38) and Kitab al-Adab (upto Bab al-Istizan):
  (i) Translation
  (ii) Critical questions

Part -II **20**

Al-Sirat al-Nabawiyyah and Islamic personal law:
Al-Sirat al-Nabawiyyah:

(a) The life of the Prophet (S.) before Hijrah;
  (i) Pre-Islamic Arabia: It's social, Political, economic, moral and religious conditions.
  (ii) The Prophet (S.): His life before Hijrah;
  (iii) Pre-Nabuwat period;
  (iv) Post-Nabuwat Period.

(b) The life of the Prophet (S.) after Hijrah;
  (i) Causes of Hijrah, Muwakhat (Islamic brotherhood),
  (ii) Charter of Madina, the first Magna Carta of the world.
  (iii) Conflict with the Quraysh and its consequence: The battles of Badr, Uhud and Ahzab etc.
  (iv) The Prophet (S.) as peace maker and the Treaty of Hudaybia Preaching of Islam to the kings and emperors of the world.
  (v) Conquest of Makka and its effects on the spread of Islam.
  (vi) The Farewell pilgrimage (Hijjatul wida)

Part - III: Islamic personal law **5**

Islamic personal law as regards marriage, dissolution of marriage and succession and inheritance.

ISLAMIC STUDIES

Part-II

Marks: 50

Part - I **25**

(a) Social System of Islam

(i) Dignity of man, Position of women, duties to parents, children, neighbours, relatives and their rights.

(ii) Concept of family welfare in the light of the Holy Quran and the Sunnah, Marriage and polygamy in Islam. The relationship between husband and wife.

(iii) Islam and Family planning in the twentieth century, concept of 'Azl' in the Hadith.

(b) Economic System of Islam:

(i) Tax structure in Islam: Zakat, Kharaj (Land Tax,) Ushur, Sadaqat, Baitul Mal etc.

(ii) Consumption and consumer, Factors of production and the concept of ownership, Distribution of Income and wealth etc.

(iii) Islamic Insurance (Takaful)

(c) Political System of Islam:
Topics to be discussed include: Millat, Khilafat, Amr bil ma' ruf wa nahy an al-Munkar, Islamic Government and individuals, Islamic legislation, Majlis-i-Shura, Sovereignty, Democracy, internal policy and foreign policy of the Islamic State.

Part - II **25**

(a) Muslim Contribution to Science and Technology:
Muslim Contribution to various Science, such as Mathematics, Medicine, Geography, Chemistry, Astronomy, Physics, Architecture and Surgery with special reference to al-khawarizimi, Ibn Sina, Yaqub Ibn Abdullah, Jabir bin Hayyan, Al-Biruni, Al-kindi, Al-Razi etc.

(b) Human Rights in Islam:
Conception of human rights in Islam : Civil, political, Social economic and cultural rights; Islam and slavery, Human rights during war; Rights of religious minorities and women; Study of human rights in Islam with special reference to the Universal Declaration of U.N.O.

(c) Study of Religions:

History Main tenets and comparative study of Islam, Hinduism, Buddhism, Judaism and Christianity.

PHILOSOPHY
(POST RELATED)
Subject Code: 211
Total Marks-100

Part-I
50 Marks

Introduction:
The nature, scope, methods and aims of Philosophy. Is Philosophy Useful in Life? Relation of Philosophy to Religion, Science and Commonsense.

Logic and Epistemology:
Logic as a normative science. The nature of Deductive and Inductive arguments.
What is knowledge? Theories of sources of Knowledge: Rationalism, Empiricism, Criticism (Kant) and Intuitionism. Realism and Idealism.

Theories of Reality:
Materialism and Idealism. Monism, Dualism and Pluralism.

Theories of Evolution:
Creation and Evolution. Types of Evolution: Mechanical, Teleological, Emergent, and Creative Evolutions.

Freedom of the Will:
Cause, Determinism and Freedom.

Philosophy of Mind:
Mind as a spiritual substance, the empirical concept of the self, Theories of mind-body relationship.

Immortality of the Soul:
Its meanings and implications, Classical proofs for immortality, Kant's ethical proof.

Value:
Fact and Value, Intrinsic and Extrinsic Values, Three cardinal values: Truth, Beauty and Goodness, Subjectivity and objectivity of values.

Truth:
What is truth? Three main theories of truth: Correspondence, Coherence and Pragmatic theories.

Philosophy of Religion:
What is meant by God? Three concepts about God: Pantheism, Deism and Theism, Proofs for God's Existence, God and the Problem of evil.

Major Trends in Contemporary Western Philosophy:
Existentialism, Logical Positivism, Pragmatism, Neo-Idealism, Neo-Realism, Intuitionism and Analytical Philosophy.

PHILOSOPHY

Part-II

50 Marks

Modern Philosophic Trends in Bangladesh:
Materialism, Idealism, Humanism and Mysticism.

Philosophic Approach to Certain Problems of Practical Life:
Suicide, Abortion, Environmental Pollution, Terrorism, Hoarding, Corruption in Profession, and Dealings with Lower Animals.

Moral Standard:
Evolution of moral standard.
The nature of moral standard. Theories of moral standard: Hedonism, Perfectionism and Law (Categorical Imperative).

Right and Duty:
Mutual involvement of right and duty. Duties towards one's fellow-human beings.

Moral Pathology:
Wrong-doing and punishment. Main theories of punishment: The Retributive Theory, the Deterrent Theory and the Reformative Theory.

Individual and Society:
Egoism, Universalism and Altruism, Justice and Beneficence.

Muslim Philosophy:
Four great medieval Muslim philosophers: Al-Farabi, IbnSina, Al-Ghazali and Ibn Rushd.
Modern Muslim Philosophers: Shah Waliullah Dehlawi and Muhammad Iqbal.

Indian Philosophy:
Buddhism, Sakhya, Naya and Vedanta Schools Swami Vivekananda and Aurobindo Ghosh.

EDUCATION
(POST RELATED)
Subject Code: 221
Total Marks-100

Part-I
Marks-50

1. Concepts and Connotations of commonly used Educational Terms:
   - Education: Origin, meaning, concept. Continental and westerns definitions;
   - Literacy and Education: Literacy and its conditions, literate and illiterate, education for all, mass education, compulsory education, work experience vocational and technical education, professional education.
   - Basic Education: Concept, components-life skills, rights of Basic Education with regard to declaration of Human Rights, Rights of the Child, Constitutional Provision, EFA and DFA.
   - Informal, Non-formal and Formal Education: Connotation, concept, nature, scope, significance of Non-formal Education, Continuing Education, Life-long Education.
2. Foundations of Education:
   - Philosophical: Theme-based major philosophies-idealism, naturalism, pragmatism, materialism, realism and existentialism.
   - Sociological: Child-society and Education, Social bases of Education and Social functions of Education.
   - Psychological: Human psychology and Education, individual needs and Education, human ability, personality and Education.

3. Organization and Management in Education:
   - Concepts and significance of Education Organization, Management, Administration, Monitoring, Inspection and Supervision;
   - Principles and functions of organization, management, monitoring and supervision;
   - Roles and Functions of Heads as Leaders;
   - Management of Curricular Activates;
   - Mobilization and Management of Funds and Resources.
4. Curriculum:
   - Concept, nature, scope and significance;
   - Curriculum and syllabus;
   - Aim, objective and competency, domains of objective;
   - Principles of Curriculum;
   - Major components of Curriculum.

5. Roles of Education in Human Resource Development:
   - Roles of Basic Education - literacy and life skils;
   - Roles of Secondary Education;
   - Roles of Higher Education;
   - Roles of Vocational/Technical Education;
   - Roles of Women's Education;
   - Roles of Professional Education;
   - Roles of Environmental Education;
   - Roles of Non-formal Education;
   - Education as a means for Poverty Reeducation: PRSP and Education.

EDUCATION

Part-II

Marks-50

1. Learner and Learning:
   - Concepts of learner and learning;
   - Child and adolescent phsiological and psychological needs and characteristics of child and adolescent;
   - Piaget's and Bruner's theories of cognitive development;
   - Insightful learning theories and their applications;
   - Connectionism, classical conditioning, operant conditioning and Gestalt Theories and their application in learning.

2. Learning Experience:
   - Concepts effective learning experience;
   - Changing roles of teacher as facilitator;
   - Criteria of facilitating learning;
   - Maxims of effective learning;
   - Learning how to learn than what to learn;
   - Child centric and joyful learning strategies;
   - Activity based learning strategies;
   - Reinforcement for effective learning;
   - Effective communication in classroom;
   - Classroom methods and techniques;
   - Classroom management and learning environment.

3. Assessment of Achievement:
   - Assessment, Measurement and Evaluation: concepts, nature, significance Test: classification, characteristics, standardization, administration, scoring
   - Analysis of test-results: use of descriptive statistics, interpretation.

4. Education in Bangladesh:
   - Historical background
   - Structure, organization and management;
   - Constitutional provision and legal framework.
   - Primary Education: structure, statistics, curriculum, development programs, major issues and problems and their solutions
   - Secondary Education: structure, statistics, curriculum, development programs, major issues and problems and their solutions
   - Higher Education: structure, statistics, curriculum, development programs, major issues and problems and their solutions
   - Language Education: nature, scope, limitation and shortcomings, possible solutions
   - Social Science Education: nature, scope, limitation and shortcomings, possible solutions
   - Mathematics, Science and Technology Education: nature, scope, limitation and shortcomings; possible solutions;
   - Technical, Vocational and Professional Education: programs, statistics, major issues and problems and their solution.

5. Teacher Education and Research in Education:
   - Primary Teacher Education: initial and in-service short programs, curriculum, modalities of delivery, shortcomings and problems, possible solution

- Secondary Teacher-Education: initial and in-service short programs, curriculum, modalities of delivery, shortcomings and problems, possible solution
- Provisions and Scope of Higher Degree in Education: Master's M.Phil and Ph.D
- Research in Education: Nature, scope, limitations and future directions.

INFORMATION AND COMMUNICATION TECHNOLOGY
(POST RELATED)
Subject Code: 281
Total Marks-100

PART-I
Marks: 50

Basic Physics
Basic elements: charge, Coulomb's law, electric field, Gauss's law, electric potential, magnetic field; Faraday's law, Maxwell's equations, Waves and oscillations, Theory of special relativity, Electromagnetic waves, Photoelectric effect, Quantum theory of light, X-ray and X-ray diffraction, Compton effect; De Broglie waves, Phase and group velocity, Wave function and wave equation.

Introduction to Computer Systems
Introduction to computations; Early history of computing devices; Computers; Major components of a computer; Hardware: processor, memory, I/O devices; Software: Operating system, application software; Basic architecture of a computer; Basic Information Technology; The Internet; Number system: binary, octal, hexadecimal, binary arithmetic.

Electrical Circuits
Circuit variables and elements**:** voltage, current, power, energy, independent and dependent sources, resistance; Basic laws of electrical circuits: Ohm's law, Kirchoff's current law (KCL) and Kirchoff's voltage law (KVL); Simple resistive circuits: series and parallel circuits, voltage and current division, source transformation; Methods of analysis: nodal and mesh analysis; Circuit theorems: Thevenin's, Norton's and superposition theorems, maximum power transfer and reciprocity theorem; Capacitors and inductors: inductors and capacitors, their characteristics, series-parallel combination of inductors and capacitors; RLC Transients.
Series and parallel AC circuits: impedance and phasor diagram, series and parallel networks, voltage divider rule, admittance and susceptance; mesh and nodal analysis, wye-delta and delta-wye conversions; superposition theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem.

Digital Logic Design
Digital logic: Boolean algebra, De Morgan's Theorems, logic gates and their truth tables, canonical forms, combinational logic circuits, minimization techniques; Arithmetic and data handling logic circuits, decoders and encoders, multiplexers and demultiplexers; Combinational circuit design; Flip-flops, race around problems; Counters: asynchronous counters, synchronous counters and their applications; PLA design; Synchronous and asynchronous logic design; State diagram, Mealy and Moore machines; State minimizations and assignments; Pulse mode logic; Fundamental mode design.

Basic Electronics
Diode circuit: current-voltage characteristics of a diode, DC and AC models, dynamic resistance and capacitance, load line, Zener regulator, half wave and full wave rectifier, voltage multiplier, clipper and clamper; Bipolar junction transistors: construction and operation, amplifying action, common base, common emitter, common collector, load line, different biasing, stability factor, small signal equivalent circuit models, BJT as a switch; Single stage amplifier: voltage and current gain, input and output impedance of a common base, common emitter and common collector, h-parameter; Field effect transistor (FET): JFET structure, operation and characteristics. MOSFET construction, operation and characteristics.

Microprocessor and Interfacing

Introduction to microprocessor: overview of computer architecture, evolution of microprocessors, difference between microprocessor and microcontroller; Introduction to 8086/8088: basic architecture of 8086, memory segmentation, flags, addressing modes, pins & signals, single and multi-processor systems; Microprocessor programming: instruction sets, introduction to assembly language programming; Tools: assemblers, debuggers, development systems; Clock and bus controller interfacing: clock generator, bus demultiplexer, bus controller interfacing; Memory Interfacing: SRAM and EEPROM interfacing, Types of I/O: parallel I/O, programmed I/O, interrupt driven I/O, I/O port address decoding, programmable peripheral interface (8255A), interface examples– Keyboard matrix, LCD/7-Segment display, printer, stepper motor, A/D and D/A converter; Timer interfacing: The 8254 programmable interval timer (PIT), timing applications; Serial I/O interface: asynchronous and synchronous communication, physical communication standard-EIA RS232, programmable communication interface, interfacing serial I/O devices- mouse, modem, PC Keyboard; Interrupts: interrupt driven I/O, software & hardware interrupts, interrupt vectors and vector table, interrupt processing, programmable interrupt controller (8259A), DMA: DMA controller (8237).

Computer Architecture

Information representation; Measuring performance; Instructions and data access methods: operations and operands of computer hardware, representing instruction, addressing styles; Arithmetic Logic Unit (ALU) operations, floating point operations, designing ALU; Processor design: datapaths & single cycle and multicycle implementations; Control Unit design - hardwared and microprogrammed; Hazards; Exceptions; Pipeline: pipelined datapath and control, superscalar and dynamic pipelining; Memory organization: cache, virtual memory, channels.

Communication Theory

Spectral analysis: Fourier series, sampling function, power spectrum, Fourier transform, convolution, Parseval's theorem; Information theory: entropy, information rate, Shannon's theorem, channel capacity;Analog communication system: different modulations, modulation circuits and detectors; Digital modulation: different standard modulation schemes; Pulse and digital signals: pulse amplitude modulation (PAM), pulse code modulation (PCM), delta modulation (DM), adaptive delta modulation (ADM); Multiplexing: time-division multiplexing (TDM) frequency-division multiplexing (FDM), multiple-access network- time-division multiple-access (TDMA), frequency-division multiple access (FDMA); code-division multiple-access (CDMA).

Computer Networking and Security

Protocol hierarchies; Data link control: HLDC; DLL in Internet; DLL of ATM; LAN Protocols: Standards IEEE 802.*; Hubs, Bridges, and Switches, FDDI, Fast Ethernet; Routing algorithm; Congestion control; Internetworking, WAN; Fragmentation; Firewalls; IPV4, IPV6, ARP, RARP, Mobile IP, Network layer of ATM; Transport protocols; Transmission control protocol: connection management, transmission policy, congestion control, timer management; UDP; AAL of ATM; Network security: Cryptography, DES, IDEA, public key algorithm; Authentication; Digital signatures; Gigabit Ethernet; Domain Name System: Name servers; Email and its privacy; SNMP; HTTP; World Wide Web.

INFORMATION AND COMMUNICATION TECHNOLOGY
PART-II
Marks: 50

Programming Language

Structured programming language: data types, operators, expressions, control structures; Functions and program structure: parameter passing conventions, scope rules and storage classes, recursion; Header files; Preprocessor; Pointers and arrays; Strings; Multidimensional array; User defined data types: structures, unions, enumerations; Input and Output: standard input and output, formatted input and output, file access; Variable length argument list; Command line parameters; Error Handling; Graphics; Linking; Library functions.

Object Oriented Programing language: Philosophy of Object Oriented Programming (OOP); Advantages of OOP over structured programming; Encapsulation, classes and objects, access specifiers, static and non-static members; Constructors, destructors and copy constructors; Array of objects, object pointers, and object references; Inheritance: single and multiple inheritance; Polymorphism: overloading, abstract classes, virtual functions and overriding; Exceptions; Object Oriented I/O; Template functions and classes; Multi-threaded Programming.

Theory: Discrete Mathematics, Theory of Computation and Basic Graph Theory

Set theory; Relations; Functions; Graph theory; Propositional calculus and predicate calculus; Mathematical reasoning: induction, contradiction and recursion; counting; Principles of inclusion and exclusion; Recurrence relations; Algebraic structures: rings and groups.

Graphs: simple graphs, digraphs, subgraphs, vertex-degrees, walks, paths and cycles; Trees, spanning trees in graphs, distance in graphs; Complementary graphs, cut-vertices, bridges and blocks, k-connected graphs; Theory of Computation: Language theory; Finite automata: deterministic finite automata, nondeterministic finite automata, equivalence and conversion of deterministic and nondeterministic finite automata, pushdown automata; Context free languages; Context free grammars; Turing Machines: basic machines, configuration, computing with Turing machines

Data Structures and Algorithms

Internal data representation; Abstract data types; Elementary data structures: arrays, lists, stacks, queues, trees, graphs; Advanced data Structures: heaps, Fibonacci heaps, B-trees; Recursion, sorting, searching, hashing, storage management.

Techniques for analysis of algorithms; Methods for the design of efficient algorithms: divide and conquer, greedy method, dynamic programming, back tracking, branch and bound; Basic search and traversal techniques; Topological sorting; Connected components, spanning trees, shortest paths; Flow algorithms; Approximation algorithms; Parallel algorithms; Algebraic simplification and transformations; Lower bound theory; NP-completeness, NP-hard and NP-complete problems.

Database Systems

Concepts of database systems; Data Models: Entity-Relationship model, Relational model; Query Languages: Relational algebra, SQL; Constraints and triggers; Functional dependencies and normalization; File organization and data storage; Indexing: primary and secondary indexes, B+ trees, hash tables; Query optimization; Transaction management; Recovery; Concurrency control; Access control and security; Semi-structured database: XML, XPath, XQuery; Object oriented and object relational databases.

Software Engineering and Information System Design

Concepts of Software Engineering, Software Engineering paradigms, Different phases of software System Development, Different types of information, qualities of information. Project Management Concepts, Software process and project Metrics, Software Project Planning, Risk Analysis and management, Project Scheduling and Tracking. Analysis Concepts and principles: requirement analysis, Analysis modeling, data modeling. Design concepts and principles, Architectural design, User Interface design, Object Oriented software development and design: Iterative Development and the Unified Process. Sequential waterfall life cycles, Inception. Use case model for requirement writing, Elaboration using System Sequence Diagram, Domain Model. Visualizing concept classes. UML diagrams, Interaction and Collaboration Diagram for designing Software.

Designing Objects with responsibilities. GRASP patterns with General Principles in assigning responsibilities: Information expert, Creator, Low Coupling and High Cohesion, Creating design class diagrams and mapping design to codes. Software Testing: White Box and Black Box testing. Basis Path Testing. Testing for specialized environment. Software testing strategies: Unit Testing, Integration Testing, Validation Testing, System Testing, Art of debugging. Analysis of System Maintenance and upgrading: Software repair, downtime, error and faults, specification and correction, Maintenance cost models, documentation. Software Quality Assurance, Quality factors. Software quality measures. Cost impact of Software defects. Concepts of Software reliability, availability and safety. Function based metrics and bang metrics. Metrics for analysis and design model. Metrics for source code, testing and maintenance

Operating System

Operating System: its role in computer systems; Operating system concepts; Operating system structure; Process: process model and implementation, Inter-Process Communication (IPC), classical IPC problems, process scheduling, multiprocessing and time-sharing; Memory management: swapping, paging, segmentation, virtual memory; Input/Output: hardware, software, disk, terminals, clocks; Deadlock: resource allocation and deadlock, deadlock detection, prevention and recovery; File Systems: files, directories, security, protection; Case study of some operating systems.

Artificial Intelligence

Introduction to old and new AI techniques; Knowledge representation; Propositional and first order logic; Search techniques in AI; Probabilistic reasoning; Natural language processing. Introduction to expert system. Introduction to machine learning; Learning algorithms: supervised and unsupervised; Practical application of machine learning; Regression; Clustering.

GEOGRAPHY

(POST RELATED)
Subject Code: 311
Total Marks-100

Part-I
Marks –50

A. Physical Geography

Definition, history and development
Nature and scope of Geomorphology
Recent trends in physical Geography

B. The Earth as a Planet

Origin of the earth
Shape and Size
Rotation and Revolution
Perihelion and Aphelion
Earth's orbit: Solstice and Equinox
Internal Structure of the Earth
World time zones
Geological Time Scale

C. The Lithosphere

Composition of the earth crust: Minerals and rocks
Diastrophism and Volcanism
Denudation and Weathering
Agents of earth sculpture: Landforms produced by the work of rivers, glaciers, wind, oceanic waves and ground water
Pre-Davision geomorphology
Davisian cycle of Erosion

D. Theories on the Various Tectonic Aspects of the Earth's Surface Processes

- Plate Tectonic Theory
- Wegner's Continental Drift Theory
- Theories of Isostasy and Gravity Tectonics

E. The Atmosphere

- Composition of the atmosphere
- Elements of climate:
- Insulation and temperature, horizontal and vertical distribution of temperature;
- Air pressure and pressure belts;
- Winds and planetary wind system;
- Humidity, types of rainfall;
- Airmass; cyclones and anticyclones; Thunderstorms;
- Major climatic types.

F. The Hydrosphere

- Hydrological cycle
- Oceans and their locations
- Profile of the ocean floor

- Major ocean currents
- Marine resources and deposition

G. The Biosphere

Definition of Ecology and Ecosystem
Soil Profile
Factors of soil formation
Major soil types of the world
Geographical Distributions of Plants
Biodiversity and conservation
Flora and Fauna of Bangladesh

GEOGRAPHY

Part-II
Marks-50

(Human Geography and Geography of Bangladesh)

Part – I Human Geography **40**

A. Human Geography
Definition scope and methodology
Branches of human
Current approaches to human Geography
Man environment interaction

B. Population
Definition and concept of population Geography
Global distribution and density
Population dynamics (fertility, mortality and migration)
Population growth theories
Population Projection
Life table
Population Policy

C. Settlements
Definition, scope and approaches of settlement Geography
Types and patterns of settlements
Rural and urban settlements

D. Economic Activities
Primary activities:
- Agriculture (major crop types, agricultural systems, livestock);
- Fisheries
- Forestry (distribution and principal use/products)
- Mining (industrial minerals and energy resources)

Secondary activities:
- Vocational factors of industry
- Global distribution of iron-steel and textile industries

Tertiary activities:
- Internal and international trade
- Transportation: land, water, air
- Service industries: commerce and finance

E. Urban Geography
- Definition, scope, methodology of urban Geography
- Urbanization concepts
- Internal structure of the city
- Hierarchy of urban areas (Christaller's theory and Growth Pole concept)
- Transportation system

Part – II Geography of Bangladesh 10

A. Natural Environment
- Geographical location and boundary
- Geology: Relief and physiography
- Soils
- River system
- Climate
- Wet lands
- Natural hazard

B. Population
- Population composition
- Density and distribution
- Population dynamics (fertility, mortality and migration)
- Population policy and problems

C. Natural Resources Base:
- Natural vegetation and forest
- Agriculture and fisheries
- Minerals and fuel energy
- Water resources and land resources

D. Economic Base:
- Industry: Nature, growth and location
- Transport and Communication
- Trade and commerce
- Urbanization and economic development

ECONOMICS

(POST RELATED)
Subject Code: 331
Total Marks-100

Part-I
(Principles of Economics)

Marks – 50

1. Micro and Macro economics. Basic Macro economic concepts in relation to the Keynesian model of income determination – relevance of Keynesian economics for underdeveloped countries.

2. Concepts of supply and demand and their determinates – concepts and measurements of various elasticities of demand and supply.

3. Cardinal and Ordinal utility – law of diminishing marginal utility – equimarginal principle.

4. The Indifference Curve analysis – Properties of Indifference Curve – consumer's equilibrium – income substitution and price effect.

5. Analysis of Production costs – Production function, Isoquants and return to scale – short run and long run cost curve – Producers equilibrium.

6. Price determination in a perfectly competitive market – equilibrium of the farm and the industry – short run and long run equilibrium – pricing under monopoly, oligopoly and monopolistic competition.

7. The Marginal Productivity theory of distribution – determination of rent, wages, interest and profit.

8. Types of function – linear, Quadratic, Hyperbolic, exponential and log functions – graphs of function. Equation of a straight line – Rectangular hyperbola – coordinates and location of points.

9. Concept of national income, utility of the study of national income, methods of measuring national income, nominal income and real income.

10. Theory of international trade: Necessity of Trade, Theory of Comparative advantage, Hecksher-ohlin theory of trade, terms of trade, gains from trade, tariffs and their justifications.

11. Globalization and its necessity, effects on the developing countries, Globalization under WTO regime.

ECONOMICS

Part-II

Marks – 50

a) Meaning of development and under development, causes of under development and their remedies – characteristics of a developing economy like Bangladesh, prospects of development of Bangladesh.

b) Issues related to development of Bangladesh: Population growth, level of unemployment, inequality in distribution of income and wealth, gender inequality, economic governance, corruption and poverty.

c) Role of Fiscal Policy in economic development: Government's budget, taxes, borrowings and repayments.

d) Role of monetary policy in economic development : role of central bank, commercial banks, specialized banks, Grameen bank, PKSP, NGOs and micro credit programs, money market, capital market, credit policy, exchange rate policy, devaluation.

e) Growth of exports, imports, terms of trade, balance of trade, foreign aid, balance of payments.

f) Changing structure of real GDP of Bangladesh (1972-2005): role of agriculture, industry and service sectors.

g) Changing structure of Bangladesh agriculture (1972-2005): role of crops, livestock, fisheries and forestry-land use pattern, agricultural productivity and reforms-self sufficiency in food.

h) Industralisation in Bangladesh (1972-2005): Role of large scale, small scale and cottage industries, RMG and other export promotion and import substitution industries.

i) Growth of service sector in Bangladesh (1972-2005) and its importance.

j) Development planning-private sector versus public – five year plans – BDF – PRSP.

k) Bangladesh economy in the era of Globalization and WTO regime: new challenges.

POLITICAL SCIENCE
(POST RELATED)
Subject Code: 341
Total Marks-100

Part-I
Marks: 50

A. Introduction to Political Science : Basic Concepts, State and its evolution, Society, Citizenship, Law, Meaning and Classification of Constitution, Classification and forms of Govt., Democratic, Dictatorial, Totalitarian, Presidential and Parliamentary, French model, Unitary, Federalism, Problems and new trends.

B. Organs of Govt. : Separation of Power-Variety and Proportional Representation, Electorate, Political Party, Interest Group, Pressure Group, Public Opinion, Bureaucracy, Elite, Local Govt., Local Self govt.

C. Nature and Meaning of Public Administration: Scope and the main elements of Public Administration, Public and Private Administration, Approaches to the Study of Public Administration.

D. Administrative Concepts: Hierarchy, Division of Work, Co-ordination, Span of Control, Unity of Command, Line and Staff, Centralization and Decentralization, Departmentalization.

E. Bureaucracy: Meaning and Characteristics, Political and Administrative Role, Administrative Accountability: Legislative, Executive and Judiciary.

F. Approaches to the Study of Politics : System Analysis, Structural-Functional Analysis, Elite Theory, Group Theory, Role Theory, Decision-Making Theory, Conflict Theory, Game Theory, Communication Theory, Psycho-Analytic approaches, Marxist and Neo-Marxist Approaches.

G. Political Thought

Greek City State and/Greek Philosophy Socrates, Plato, Aristotle.

Kautilya and Arthashastra

Confucianism, Taoism

Ibne Khaldun, Imam Gazzali

Machiavelli, Hobbes, Locks, Montesquieu, Rousseau

Karl Marx, Mao-Ze-Dong.

POLITICAL SCIENCE

Part-II

Marks: 50

A. Politics in Bangladesh: Geography, History, Society, Culture.

B. The Liberation War and its Background: Language Movement, 1952; Constitutional Movement, 1962; Autonomy Movement, 1966; Mass Movement, 1968, 1969; Non-Cooperation Movement, 1971.

Liberation War-Courses and various Dimensions.

C. Political Process & Constitution Making: Political Development, 1972-2005. Rule of Military and Military withdrawal from Politics, Role of Opposition, The Concept of Caretaker Govt. Amendments to the Constitution.

D. Foreign Policy of Bangladesh: The Big Power Diplomacy in the Bangladesh Liberation War, The Nature and the Objectives of Bangladesh's Foreign Policy, Foreign Policy Making Process in Bangladesh, Economic and Political bases of Bangladesh Foreign Policy, Bangladesh and its South Asian Neighbours, Bangladesh's Relations with the US, Former Soviet Union, Russia, China and the EU, Bangladesh and the Islamic World, Bangladesh and UNO, Recent trends in Bangladesh Foreign Policy.

E. International Politics of South & South East Asia: The Region, Social & Cultural Setting, Historical & Colonial Experience, Nationalist Movement, Nature & Political System: Democratic Setup, The Foreign Policies of South and South East Asian Countries, The Formation of SAARC, ASEAN, and Future Prospects.

F. Major Political Systems: UK, USA, PRC and Japan.

SOCIOLOGY

(POST RELATED)
Subject Code: 351
Total Marks-100

Part-I

Marks: 50

(Introducing Sociology)

1. Subject matter of Sociology

1.1 Definition, nature, scope & importance.
1.2 Origin and development of Sociology.
1.3 Sociology and other social sciences.
1.4 Research methods in Sociology.

2. Some Primary Concepts of Sociology

2.1 Society, community, association, institution, group.
2.2. Culture, civilization, cultural lag, social structure.
2.3 Family, marriage, property, state and religion.

3. Stage of Development of Human Society

3.1 Pre-industrial society, ancient society, pastoral society, agricultural society.
3.2 Industrial society and post-industrial society.

4. Social Institutions

4.1 Family, types, functions and future.
4.2 Marriage, types and functions.

5. Economic Institution

5.1 Property, definition, types, forms of ownership.
5.2 Origin of private property-primitive communism-arguments for and against private ownership.
5.3 Economic systems-capitalism, socialism and mixed economy.
5.4 Property in ancient society, pastoral, agricultural and industrial society.

6. Political Institution

6.1 State, state and government.
6.2 Legitimacy, power and authority.
6.3 Marx and state.
6.4 Democracy and state.

7. Social Stratification & Social Mobility

7.1 The concept of social stratification-its characteristics & consequences.
7.2 Major types of social stratification, slavery, estate, caste, class & status.
7.3 Theories of social stratification-functionalist and conflict theories.
7.4 Towards an integrative theory, Dahrendrof & Lenski's theories.

7.5 Social mobility-types and causes of mobility-horizontal & vertical mobility.

8. Deviance and Social Control

8.1 Crime and deviance, functions and dysfunction of crime, types of crime and criminal.
8.2 Etiology of crime and deviance, biological, psychological and sociological theories.
8.3 Social control-signification and agencies of social control. Formal and informal agencies.

9. Population and Society

9.1 Fertility, mortality and migration.
9.2 Population growth and problem, causes and consequences of population growth.
9.3 Theories-Malthus, Demographic transition, optimum, population theory.
9.4 Solutions to population problem.

10. Social Change

10.1 The concept of social changes.
10.2 Theories of social change linear theories-Comte, Spencer, Hobhbouse, Marx.
10.3 Cyclical theories, bio-cyclical theory-Spengler's theory-Pareto's theory-Chapin's theory-Sorokin's theory-Toynbee's theory.
10.4 Ancient & medieval theories of social change.
10.5 Invention, discovery & diffusion and social change-general causes of social change.
10.6 Planned social change.

SOCIOLOGY
Part-II

(Social and Culture of Bangladesh)

Marks: 50

1. The People of Bangladesh

1.1 Race: the racial characteristics of the people of Bangladesh.
1.2 The ethnic & linguistic composition.
1.3 Major religious communities of Bangladesh.
1.4 The land, people of physical environment

2. The major archeological sites of Bangladesh

2.1 Mahastan Garh.
2.2 Mainamoti.
2.3 Paharpur.
- The archeological relics and their socio-historical significance.

3. The Indus Valley Civilization

3.1 Brief history of the civilization.
3.2 Relics and their significance

4. Glimpses of Social History of Bangladesh

4.1 Society and economy of pre-British Bengal. Self-sufficient village communities.
4.2 The advent of the British Rule in Sub-Continent and its impact. Permanent Settlement Act of 1993; Introduction of English Education; Growth of Middle Class; Society and Economy during Pakistani Rule.
4.3 Social background of the emergence of Bangladesh as an independent state.

5. Rural and Urban Society of Bangladesh

5.1 Rural and urban life: an overview.
5.2 Rural and urban social life of Bangladesh: socio-economic, politico-cultural, education & religious life.
5.3 Rural and urban social stratification.
5.4 Power structure: rural and urban.

6. Family, Marriage and Kinship in Bangladesh

6.1 Family, types, rule and functions.
6.2 Marriage, types, role and functions.
6.3 Kinship- types, role and functions.

7. Industrialization & Urbanization in Bangladesh

7.1 Industrial society: an overview.
7.2 Importance of Industrialization.
7.3 Obstacles to industrialization.
7.4 Urbanization & urbanism in Bangladesh.
7.5 Major urban problems.
7.6 Impact of urbanization and industrialization upon the society of Bangladesh.

8. The Ethnic Societies of Bangladesh

(Some major ethnic societies)

8.1 The Chakma society
8.2 The Marma society
8.3 The Garo society
8.4 The Santal society

9. Social Problems in Bangladesh

(Some selected problems)

9.1 Population problem-causes, consequences & solutions.
9.2 Poverty- causes, consequences & solutions.
9.3 Illiteracy- causes, consequences & solutions.
9.4 Dowry- causes, consequences & solutions.
9.5 Problems of unemployment- causes, consequences & solutions.

10. Social change in Bangladesh

10.1 The concept in social change.
10.2 Present social structure of Bangladesh.
10.3 Social change in Bangladesh-causes and consequences-problems and prospects.

SOCIAL WELFARE/SOCIAL WORK

(POST RELATED)
Subject Code: 361
Total Marks-100
Part-I
Marks: 50

(i) Meaning objectives, scope and necessity of social welfare or social work. Welfare State.

(ii) Nature of social work in pre and post industrial society, basic differences of social work between pre and post industrial society, contributions of traditional social welfare to the development of organized and modern social work.

(iii) Industrial Revolution, its meaning and impact on social life, Industrialization and Urbanization, emergence of social problems due to industrialization and urbanization, social services to combat the problems of industrialization and urbanization.

(iv) Relationship of social welfare/social work with other branches of science/social science - Psychology, Sociology, Economics, Political Science, Anthropology, Philosophy and Public Administration.

(v) Some important concepts related to social welfare: social work, social service, social security, social change and social development.

(vi) Historical Foundation of social welfare in Indo-Pak-Bangladesh sub-continent: Ancient, Medieval and British Period, Evolution of social welfare in Bangladesh.

(vii) Reform movement and its meaning and importance, some reform movements of the sub-continent- Brahma Samaj, Faraizee Movement, Ram Krishna Mission, Mohammedan Literary Society and Aligarh Movement.

(viii) Philosophical values of social work, contributions of major religions to the development of modern social work-Islam, Hinduism, Buddhism, and Christianity. Human Rights and social justice and its relationship with social welfare/social work.

(ix) Importance of social legislation in social welfare/social work, some important social legislations in Bangladesh- the Workmen's Compensation Act of 1923, The Maternity Benefits Act of 1939, The Children Act of 1974, The Dowry Prohibition Act of 1980.

(x) Social work as a profession: Definition and characteristics of profession, evolution of social work as a profession, difference between professional non-professional social work. Social work in Developing countries.

SOCIAL WELFARE/SOCIAL WORK

Part-II

Marks: 50

(i) Basic human needs- food, clothing, shelter, health, education, recreation and their bearing on human life and welfare with special reference to Bangladesh.

(ii) Major social evils and social problems in Bangladesh- poverty, unemployment, ill health, beggary, over-population, illiteracy, drug addiction, crime and delinquency- their causes, effects and remedies.

(iii) Constitutional guarantee of social welfare and social security in Bangladesh, Social Welfare in the five-year plans of Bangladesh.

(iv) Social Services under Social Service Development: Urban Community Development, Rural Social Service, Child Welfare, Correctional Services, Medical Social Work, Training and Rehabilitation Programmes for the Handicapped.

(v) Social Services outside Social Service Department: BRDB, Family Planning, Youth Welfare, Labour Welfare, Co-operative and Women Welfare.

(vi) Social Work Methods, types and importance of social work methods, interrelatedness of social work methods.

(vii) Definition, scope and significance of social Case Work, social group work, community organization and community development.

(viii) Social Case Work as a problem-solving process - its elements, steps and methods.

(ix) Use of Social Group Work as a problem-solving process in the context of Bangladesh. Scope and importance of Community development in Bangladesh.

(x) Definition and role of Social Administration in promoting social welfare in Bangladesh. Social Action as method of social change.

HOME ECONOMICS

(POST RELATED)
Subject Code: 391
Total Marks-100

Part-I
Marks: 50

Part –I: Home Management and Housing 25

1. Definition, meaning and scope of Home Management
    a. Home Management as a course of study.
    b. As a responsibility of manager of family.
    c. Scope and application of management principles.
    d. Socio-cultural & economic changer & its effect on home management.

2. Functions of Home Management
    a. Function of a home manager
    b. Management Process:
        (i) Goal setting, (ii) Planning& decision making, (iii) Organizing (iv) Controlling, (v) Evaluating (vi) Communicating.

3. Management of Resources in Day to day living
    a. Definition, classification & characteristics of resources.
    b. Guidelines for the use of resources.
    c. Motivational components in the management of resources.

4. Financial Management
    a. Family Income-types & income of budgeting income.
    b. Family expenditure & means of controlling it.

5. Management of Energy & Time :
    a. Courses of control of fatigue.
    b. Ways of improving work in the home same time.
        (i) Effective use of body posture.
        (ii) Effective measure of work simplification.

6. Family Housing & Interior Decoration:
    c. Housing needs of the family.
    d. Basic principle of House Planning & site selection.
    e. Building materials-knowledge of traditional, low cost & modern materials.
    f. Home furnishings in Interior decoration
        (i) Art principle & elements of design in home furnishings.
        (ii) Arousing furniture & accessories, light & colour in interior decoration.

Part-2: Art, Family, Clothing & Textiles 25

1. Planning the Family wardrobe
    a. Special emphasis on budget, occupation, climate, family composition, fashion accessories etc.
    b. Art elements of principles its relation to choice of clothing & design?
    c. Personality & selection of clothing.
    d. Care & storage of clothing.

2. Textile Fibers :
    a. Sources & classification of fibers
    b. Characteristics of fibers-
        (i) Physical characteristics
        (ii) Chemical characteristics
        (iii) Basic Performance characteristics.

3. Identification of Textile fibers :
    a. Physical methods-feeling test, moisture test, burning test.
    b. Chemical and other methods

4. Finishing Processes of fibers :
    a. Objective & methods of fiber finishing
    b. Process of manufacturing fiber
    c. Classification of woven & knitted fabrics.
    d. Dyeing and Printing of fiber & fabrics.

5. Fashioning clothing and Textiles
    a. Definition of fashion & fashion promotion
    b. Factors inflecting changer in fashion
    c. General economic importance of fashion & its implication on textile industry.

HOME ECONOMICS

Part-II
Marks: 50

Part–I: Child development & Family Relation 25

1. Meaning of growth & development –
    a. Principle of Childs development.
    b. Methods of studying child's behaviour and development.

2. States of child's development
    a. Characteristics of child's nature at different stages of development
        (i) Early childhood
        (ii) Middle childhood
        (iii) Preadolescent
        (iv) Adolescent.

3. Different aspects of development-

   (i) Physical development & maturation
   (j) Mental development
   (k) Social development
   (l) Emotional development
   (m) Factors effecting development at different stages.

4. Adolescence-

   (i) Physical champers in adolescent years
   (ii) cognitive & intellectual development
   (iii) Social & personality development
   (iv) Problems of adolescence-aggression, juvenile delinquency, addiction to drugs – causes & remedies

5. Functions of Family:-

   a. Stages of family life cycle and changer in family functions.
   b. Changer in family function due to urbanization, industrialization, women's employment etc.

6. Family Relations-

   1. Factors influencing family relation
   2. Relationship between parents & children.
   3. Principles of child's guidance at different stages of development
   4. Family crisis – effect on child's development, ways to improve family relations and family solidarity.

Part-II: Food & Nutrition 25

1. Basic Knowledge of Food & Nutrition
   a. Function of food in the body
   b. Relation between health, food and nutrition
2. Classification functions, food sources & deficiency diseases of the following nutrition-
   a. Carbohydrate, (b) Proteins, (c) Lets, (d) Vitamins, (e) Minerals.
3. Balanced Diets
   a. Food grows & their significance
   b. Principles of planning balanced diets using food groups.
   c. Factors influencing planning of balanced diets.
   d. Balanced diets in pregnancy, lactation, infamy, childhood & old age.

4. Therapeutic Diet
   a. Meaning & planning of Therapeutic diets.
   b. Kinds of Therapeutic diets.
   c. Diet Therapy in different diseases-diabetes, high blood pressure, heart disease, renal diseases & liver diseases.

5. Food Contamination and Food Spoilage-
   (a) Censer of food contamination, food borne diseases.

(b) Types of good spoilage, characteristics of spoiled foods.
(c)Ways of preventing food contamination
(d) Principles and methods of food preservation.

6. Nutrition situation in Bangladesh
   a. Etiology of malnutrition-PEM, IDA, IDD & other micronutrient deficiencies.
   b. Nutritional assessment-anthropometrical, clinical & biochemical methods of assessing nutritional status.
   c. Role of government & NGO in nutritional sector-Food supplementation, fortification & rehabilitation.

PHYSICS
(POST RELATED)
Subject Code: 511
Total Marks-100

Part-**I**
Marks: 50

(a) Mechanics:
- i. Particle Dynamics: Newton's law of motion, Motion in one dimension, Motion in a plane, Work, energy and power, Conservation laws, Conservative force, Mass-energy relation.
- ii. Rotational Motion: Angular velocity, Angular acceleration, uniformly accelerated angular motion, Torque, Kinetic energy of rotation, Angular momentum, Moment of inertia.
- iii. Gravitation: Newton's law of gravitation, variation of acceleration due to gravity, Gravitational field and gravitational potential, Calculation of potential and force in simple cases.

(b) Properties of Matter:
- i. Elasticity: Stress and strain, Hooke's law, Elastic modulii, bending of beams, Torsion.
- ii. Surface Tension: Adhesive force, cohesive force, Molecular theory of surface tension, Surface energy and surface tension, Angle of contact and capillarity.
- iii. Viscosity: Newton's law of viscosity, Streamline and turbulent motion, Poiseulle's formula, Bernouli's theorem, Applications.

(c) Waves and Oscillation:
- i. Waves: Transverse and longitudinal wave, Traveling and stationary wave, Vibration in strings, Resonance, Beats, Doppler effect.
- ii. Sources and propagation of sound, Spiced of sound, Ultrasonic.
- iii. Oscillation: Definition of simple harmonic motion (SHM), combination of two SHM's, damped oscillation, Forced oscillation, Resonance, Power and intensity of wave motion, Simple and compound pendulum.

(d) Heat, Thermodynamics and kinetic Theory of Gases:
- i. Heat and Temperature: Concept of temperature, Thermal equilibrium, Temperature scale, Mechanical equivalent of heat, quantity of heat, Specific heat and heat capacity.
- ii. Transmission of heat: Conduction, Convection and Radiation, Conduction of heat in solids, Co-efficient of conductivity, Measurement of conductivity of a poor conductor.
- iii. Thermodynamics : First law, difference between Cp and Cv for an ideal gas, Adiabatic process for an ideal gas, Second law, Entropy and disorder, Absolute scale of temperature, Thermodynamic functions, Maxwell relations, Clausius-Clapeyron equation, Gibbs phase rule.
- iv. Kinetic theory of gases: Basic assumptions, Equation of state of an ideal gas, Kinetic interpretation of temperature and pressure, Mean free path, Equipartition law, Van der Waal's equation of state.

(e) Electricity and magnetism:

i. Charge and Matter, Electric field, point charge in an electric field, Dipole in an electric field. Gauss's law and Coulomb's law: Application to a spherically symmetric charge distribution and a charge sheet; Electric potential: potential and field strength; potential due to a point charge; Due to a dipole; Calculation of E from V.
ii. Capacitance and dielectric: Calculation of capacitance, Dielectric and Gauss's Law, Energy storage in dielectric.
iii. Current and Circuits: Ohm's law, Resistivity and atomic view, Electromotive force Kirchoff's law, Wheatstone bridge, Potentiometer.
iv. Magnetic field: Definition of B, Ampere's law, Biot-Savart law, Magnetic force on a current, Torque on a current loop, Electric meters.
v. Faraday's law: Inductance, Energy density and the magnetic field, Diamagnetism, Paramagnetism and Ferro-magnetism.
vi. Electromagnetic Oscillation: LC oscillation, Maxwell's field equations.
vii. Alternating current: Alternating emf, LCR circuit, Effective of RMS value of voltage and current.

(f) Optics:

i. Nature and propagation of light: Light and the electromagnetic spectrum, Velocity of light, Huygen's principle and the laws of reflection and refraction, Total internal reflection.
ii. Interference and Diffraction : Young's experiment, Coherence, Michelson's interferometer, Diffraction from single slit, double slit and grating, X-ray diffraction and Bragg's law, Resolving power.

PHYSICS
Part-**II**
Marks: 50

(a) Classical Mechanics and Special theory of Relativity:
- i. Conservation laws of a system of particles. Rocket motion. Generalized coordinates.
- ii. Euler-Lagrange equations of motion. Hamilton's Principle.
- iii. Principle of least action, Hamilton's equation of motion.
- iv. Postulates of special theory of relativity. Lorentz transformation.
- v. Relativistic equations of motion.

(b) Quantum Mechanics:
- i. Schrodinger equation. Postulates of quantum mechanics. Probability in quantum mechanics.
- ii. Fundamental commulation relations.
- iii. Heisenberg's uncertainty relations.
- iv. Operators and Eigenvalue equation.
- v. Eigenvalue and Eigenfunctions.
- vi. Hermitian operators.
- vii. Eigenvalues of the angular momentum operator. Spin angular momentum operator.
- viii. Approxmation methods. WKB Approxmation.

(c) Atomic and Molecular Physics:
- i. Quantum character of radiations.
- ii. Photoelectric effect. Compton Effect.
- iii. Wave-particle duality. De Broglie wave.
- iv. Electron diffraction.
- v. Rutherford experiment
- vi. Bohr's theory and hydrogen atom.
- vii. Atomic spectra.
- viii. Pauli's principle. Electronics configuration of atom.
- ix. Production of X-ray, Moseley's law.
- x. Molecular spectra.
- xi. Laser. Three and four level lasers.
- xii. Properties of a laser beam. Ruby, He-Ne,
- xiii. Nd: Y and CO_2 lasers, Applications of lasers.

(d) Nuclear Physics:
- i. Constituents of Nuclei, Nuclear density, nuclear spin and angular momentum, Nuclear force.
- ii. Nuclear binding energy, Liquid drop model, Shell model.
- iii. Radioactive decay, Decay law.
- iv. Radioisope-productions and uses.
- v. Alpha particle emission, Beta decay, Gamma radiation.
- vi. Nuclear reaction, Q-value.
- vii. Nuclear fission and fusion, Nuclear reactor.
- viii. Particle accelerators-Van-de-Graff accelerator, Linear accelerator, Cyclotron, Sychrotron.
- ix. Elementary particles.

(e) Solid State Physics:

i. Crystalline nature of solids. Unit cell, Classification of solids-lonic, Valence and Vander Waals Crystals. Madelung constant, Theory of specific hearts, Einstein and Debye model.
ii. Defects in srystals-Schottky and Frendel types, Dislocations, Consequences of defects on Mechanical properties.
iii. Band theory of solids.
iv. Semiconductors-Extrinsic, Semiconductor, Density of states. Charge carrier.
v. Superconductivity, Introduction to high Tc superconductivity.

(f) Electronics:

i. Semiconductor diode. P-n junctions.
ii. Breakdown Avalance and Zener Mechanism
iii. Rectification.
iv. Bipolar Junction Transistor (npn & pnp)
v. Transistor action, Amplifiers (CB, CE & CC)
vi. Operational Amplifier, Inverting amplifier non-inverting amplifier, Adder subs tractor, Comparator, Integrator, Differentiator, FET and MOSFET Applications.
vii. SCR and TRIAC action and characteristics.
viii. Modulation and Demodulation (AM, FM)
ix. Television and RADAR.

CHEMISTRY
(POST RELATED)
Subject Code: 531
Total Marks-100

Part-I
Marks: 50

I. Gas Laws, Kinetic theory of gases, Liquifaction of gases, Energy changes, Enthalpy changes & determination, The law of energetics, Elementary principles of thermodynamics, the nature of △S, △H and △G, Electro chemistry-Electrode potentials, Voltace cells, Redox electrodes, The Nernst equation, Colligative properties of solutions, Phase rule, Chemical equilibria and chemical kinetics, pH and buffer solutions, Conductance Theoretical aspects of chemical equilibria and chemical kinetics, pH and buffer solutions, Conductance Theoretical aspects of chemical and instrumental methods of analyses and their applications.

II. Atomic Structure, Periodic table and Classification of elements, Chemical bonds, Oxidation and reductions, detailed group chemistry.

III. Radioactivity, Nuclear reactions and atomic energy, Elementary aspects of environmental chemistry.

IV. Organic compounds-aliphatic, aromatic and heterocyclies, Synthesis and chemical properties of different classes of compound, Confirmation, Stereochemistry, Optical activity, General concepts of nucleophilic, electrophilic and free radical reactions.

V. Aromatic and heterocyclic compounds and their substitution reactions.

VI. Principles of manufacturing common organic and inorganic industrial products. Disposal of Industrial wastes.

CHEMISTRY
Part-II
Marks: 50

This Paper should contain advanced Topics of Physical, Inorganic and Organic Chemistry including Chromatography and Spectroscopy.

I. Acids, Bases, Nucleophiles, Electrophiles.

II. Hard and soft Nucleophiles and electrophiles Molecular or bitals & Frontier or bitals-HOMO & LUMO Kinetics and energetics in reaction mechanism. Comprehensive treatment of solvolytic reactions substitution reactions of ambidient nucleophiles, Multicentre addition reactions, Carbonium ion rearrangements.

III. Chirality, Molecular dissymmetry, Atomic asymmetry & conformational asymmetry, Circular bifreingence & circular dichroism, Cotton effect, Optical rotatory dispersion and their application, Purity of optical analysis, Conformational analysis.

IV. Atropisomerism.

V. UV, IR, Raman, ESR, ^{1}H & ^{13}C NMR, Mass spectrometry-Principles and utility (application).

VI. Different chromatographic techniques-

VII. Principles and applications, Advantages & disadvantages.

VIII. Carbohydrates & Polysaccharides, Starch, Cellulose, Aminoacids, Proteins, Vitamins, Hormones, Antibiotics, Alkaloids, Dyes.

APPLIED CHEMISTRY

(POST RELATED)
Subject Code: 541
Total Marks-100

Part-I
Marks: 50

1. Importance of Chemical technological processes. Development of Chemical technology, Classification of Chemical technological processes.

2. Techno-economic feasibility study of a project. Site selection for chemical industry. Unit process and unit operation. Design and implementation of a chemical project.

3. Chemical Process Industries: Fundamentals of Chemicals Industries, Importance of Chemical Technology for Industry. Pre-conditions for setting up of a new Chemical Industry. Problems of Chemical Process Industries in Bangladesh and their solutions.

4. Fluid Mechanics: Types of fluid, general properties of fluid, Fluid statics, Fluid dynamics, Euler's equation, Bernoulli's equation, Fluid flow measurement.

5. Corrosion: Corrosion damage. Types of Corrosion. Corrosion prevention. Electrochemical aspects of Corrosion, Corrosion Testing.

6. Metallurgy of Iron: Detailed Study on Pig iron, Wrought iron and steel.

7. Principles of industrial separation processes. Distillation: Design & operating characteristics of plate column, operation efficiency. Analysis of fractionating column by McCode-Thiele method and enthalpy-concentration method. Construction details of plate column, sieve column.

8. Refrigeration and Air conditioning: Basic theory. Compression and Absorption Refrigeration Cycles. Ammonia Absorption machines. Refrigerants.

9. Air and water pollution. Greenhouse effect. Ozone hole. Kyoto protocol. Industrial waste management.

10. Water conditioning and water treatment. Physical and chemical methods of treatment. Municipal water supply. Boiler feed water. Water treatment plants in Bangladesh. Electrodialysis, ultrafiltration, activated carbon absorption, BOD, COD.

APPLIED CHEMISTRY
Part-II
Marks: 50

1. **Sulphur and sulphuric Acid:** Sources of sulphur, Recovery of sulfur from nature, Manufacture of sulphuric acid, Environmental aspects.

2. **Fertilizer Industry:** Technological aspects of Fertilizer industries of Bangladesh. Ammonia, Urea and triple sugperphosphate manufacturing processes. Environmental aspects.

3. **Sugar industry:** Manufacture of sugar from sugarcane and sugar beat. Utilization of byproducts. Sugar Industry in Bangladesh.

4. **Coal:** Coal deposits in Bangladesh. Composition, classification, carbonization, gasification. Utilization and environmental aspects.

5. **Petroleum:** Atmospheric and Vacuum distillation. Thermal cracking, catalytic cracking, Reforming, Hydrocracking. Products of petroleum processing and their uses. Petroleum refining industry in Bangladesh.

6. **Glass and Ceramics**: Composition, classification, manufacturing processes, special glasses and ceramic products.

7. **Cement:** Classification, strength of cement. Cement kilns. Manufacturing processes. Cement industry in Bangladesh.

8. **Caustic-Chlorine Industries:** Methods of production of caustic soda and soda ash. Electrolytic process for caustic soda and chlorine. Diaphragm, Mercury and Membrane processes. Caustic soda-chlorine industry in Bangladesh. Environmental aspects.

9. **Plastic Industry:** Polyethylene, polypropylene, polyvinyl chloride, polymethylacrylate, polystyrene.

10. **Pulp, Paper and Rayon Industries:** Manufacturing processes and their comparisons. Environmental aspects.

11. **Soaps and Detergents:** Manufacture of Soap, Detergent and Glycerine.

12. **Leather Industry**: Leather processing including Chrome and Vegetable Training.

13. **Edible oils:** Extraction, Purification and Hydrogenation, Different Tests for Oils.

14. **Surface Coatings:** Paints; Pigments; Varnishes; Lacquers-constituents, manufacture, classification and application.

MATHEMATICS
(POST RELATED)
Subject Code: 551
Total Marks-100

Part-I
Marks: 50

Group-A: Algebra, Analytical Geometry, Linear Algebra. 25

1. Order properties of real numbers. Inequalities involving different types of means, Chebyshev's inequality.
2. Complex numbers, DeMoivre's theorem and its applications.
3. Summation of finite algebraic and trigono
4. metric series.
5. Polynomials and their roots, Honer's scheme (synthetic division), Descartes rule of signs.
6. Relation between roots and coefficients. Symmetric functions of roots.

Analytical Geometry

1. Pairs of straight lines. Transformation of coordinates.
2. General equation of the second degree, Reduction to standard forms, Conics in general.
3. Planes and straight lines in three dimensions, shortest distance between two straight lines.
4. Vector algebra with applications to geometry.

Linear Algebra

1. Algebra of Matrices. Systems of linear equations and their solutions.
2. Vector spaces over the field of real numbers, Subspaces, Linear dependence and independence of vectors, Basis and dimension.
3. Linear transformations, Rank and nullity.
4. Eigenvectors and eigenvalues.

Group-B. Differential and Integral Calculus (including Elementary Real Analysis) 25

1. Sets of real numbers, Supremum and infimum, the completeness axiom Dedekind's theorem, The Archimendian property.
2. Convergence of infinite sequences and series of real numbers, Standard theorems and tests of convergence. Absolute convergence.
3. Continuous functions. Intermediate value theorem. Uniform continuity.
4. The derivative. Rolle's Theorem, Mean value theorems, Toylor's theorem with remainder, Taylor's series, indeterminate forms.
5. Maxima, minima, tangents and normals.
6. Indefinite integrals, Techniques of integration, Recurrence Relations.
7. The Riemann integral, The fundamental theorem of calculus.
8. Improper integrals. Tests of convergence.
9. Determination of areas and volumes.

MATHEMATICS
Part-II
Marks: 50

Group-A: Mechanics 25

1. General conditions of equilibrium, Principle of virtual work, Stable and unstable equilibrium, Centre of gravity.
2. Rectilinear motion, simple harmonic motion, Motion in a plane, Motion under a central force.
3. Dynamics of rigid bodies, Moments of inertia, A' Alembert's principle.
4. Motion about a fixed axis.
5. Lagrange's equation for holonomic systems.

Group-B: Methods of Applied Mathematics 25

1. Ordinary differential equations of first and second order.
2. Liner equations with constant coefficients.
3. Solution of differential equations in series.
4. Beata and Gamma functions.
5. Special functions, Legendre, Hermite and Languerre polynomials; Bessel functions. Generating functions, recurrence relations and other properties.
6. Complex functions, Differentiability, Cauchy-Riemann equations, Analytic function. Complex integration, Cauchy' theorem and Chuchy's integral formula, Taylor and Laurent expansions. Singularities, poles and residues.
7. Cauchy's residue theorem, Evaluation of definite integrals.

APPLIED MATHEMATICS

(POST RELATED)
Subject Code: 561
Total Marks-100

Part-I
Marks: 50

Group-A: Statics

(a) Forces acting in a plane, parallel forces, moments and couples.
(b) Equilibrium of coplanar forces. Astatic, stable and unstable equilibrium.
(c) Work, Virtual work.
(d) Centre of gravity. Forces in three dimensions.

Group-B: Dynamics

(a) Motion in a straight line, Simple harmonic motion.
(b) Motion in a plane referred to Cartesian and polar coordinates. Radial and transverse velocities; central, tangential and normal acceleration. Central forces.
(c) Motion in resisting medium.
(d) Motion in three dimensions.

Group-C: Mathematical Methods

(a) The Laplace Transform: Definition, existence and basic properties Differentiation and integration, Inverse Laplace transform and convolution, Solution of linear differential equations with constant coefficients.
(b) Bessel's Equation: Solution, Generating function, Recurrence relation, Orthogonality.
(c) Legendre's Equation: Solution, Generating function, Recurrence relation, Rodrigui's formula and orthogonality of Legndre Polynomial.
(d) Fortier Series: Fortier Coefficients, Sine and Cosine series, Dirichlet's theorem, Properties and applications.

APPLIED MATHEMATICS
Part-II
Marks: 50

Group-A: Real Analysis

(a) Metric Spaces: Definition and examples. Open and closed sets, Compact sets, perfect set and cantor set.
(b) Sequence: Convergent sequence, bounded' sequence, subsequence, Cauchy sequence, and completeness of IR.
(c) Differentiation: Continuous function. Derivative of a function. Rolle's Theorem, Mean-value theorem, Toylor's theorem.
(d) Functions of Several Variables: Limit and Continuity. Partial differentiation. Schwarz's theorem, Young's theorem.

Group-B: Complex Analysis

(a) Complex Functions: Single and many valued functions. Limit, Continuity and differentiability of complex function.
(b) Analytic Functions: Necessary and sufficient conditions. Harmonic functions. Mobius transformation and power series.
(c) Complex Integration: Zeros of analytic functions, Cauchy's theorem, Morera's theorem, Cauchy's integral formula, Singularities, Classification of singularities.
(d) Complex integration: The open mapping theorem, Taylor's and Laurent series. Fundamental theorem of algebra, Rouches theorem, The residue theorem, Contour integration.

Group-C: Numerical Analysis

(a) Solution of algebraic and transcendental equation, Interpolation.
(b) Numerical solution of linear and non-linear system of equations.
(c) Numerical differentiation and integration.
(d) Numerical solutions of ordinary differential equation.

Group-D: Hydrodynamics

(a) Velocity and acceleration of fluid particles, Steady and unsteady flows, Uniform and non-uniform flows, Stream lines, path lines, vortex lines and velocity potential. Rotational and irrotational flows. Equation of continuity.
(b) Euler's equation of motion, conservative field force. Lamb's equations of motion. Bernouli's equation.
(c) Motion in two-dimensions, stream function and its physical meaning, velocity in polar coordinates, relation between stream function and velocity.
(d) Sources, sinks and doublets. Complex potential and complex velocity, stagnation points, Complex potential due to a source and a doublet. Circulation and vorticity, relation between circulation and vorticity. Kelvin's Circulation theorem.

GEOLOGY

(POST RELATED)
Subject Code: 571
Total Marks-100

Part-I
Marks -50

1. Physical Geology and Geomorphology:
   Introduction to the science of Geology and historical development, the Earth and its position in space and solar system; its origin; interior of the Earth; the Earth materials and crystal processes. Evolution of crystal features and fundamentals of plate tectonics. Theory of Isostasy, Diastrophism, Magmatism and volcanism.

   Earth's surface processes-Natural agents of sculpturing the Earth's surface(Running water, Glaciers, wind) and their origin; alluvial processes and morphology; geo-morphological tools; methods of study of geomorphic features; morphometric units of Bangladesh.

2. History of Geology:
   Fundamental laws of historical geology; geological time and methods of measurements; geological column; geological time scale; evolution of the Earth and origin of life; fossils; major physical events and life forms and their evolution through geological time; glaciation; palaeomagnetism; polar wandering; brief geological history of the Indian subcontinent.

3. Petrology and Mineralogy:
   Introductory crystallography and different crystal forms. Study of the physical properties, and classification of common rock forming minerals. Rocks and rock cycle, study of the mode of occurence, texture, structure, composition and classification of Igneous, Metamorphic & Sedimentary rock.

4. Structural Geology and Tectonics:
   Deformation of the earth crust: structural features (fold, joint, fault and unconformity). Concept of continental drift, Rise of theory of Plate tectonics, and Sea floor spreading. Tectonics and Structural framework of Bangladesh. Causes, types, distributions and effects of earthquake & tsunami and volcanoes.

5. Rock Mechanics & Engineering Geology:
   Stress analysis-theory, stress components, stress ellipsoid, relation of rupture to stress, Stain analysis-theory, geological significance of strains, mechanics of deformation. Surface and subsurface investigations, sampling and sampling methods. Engineering properties of soil geological criteria for site selection.

6. Oceanography:
   Distribution and origin of the ocean; ocean morphology-physical features of deep ocean floor including the ridges, rises and trenches. Sea-floor spreading, major tectonic features and tectonic history of the oceans. Bengal Deep Sea Fan and other bottom topographical features of the Bay of Bengal. Mineral resources of the oceans.

GEOLOGY

Part-II

Mark-50

1. Stratigraphy:
   Principles of Stratigraphy, Stratigraphic Correlation; Stratigraphic outline of Bangladesh and adjoining areas. Quaternary geology of the Bengal basin-physical framework and its landforms, distribution of the Quaternary deposits.

2. Exploration methods:
   Widely used methods in exploration like: Seismic method-Importance of seismic work, geometry of seismic wave path, reflection and refraction field methods and equipment, elevation and weathering correction of seismic data, velocity, and depth and dip determination by reflection and refraction data both for single layer and multi layer, interpretation of seismic sections. Gravity method-introduction, earth's gravity field and its variations, reduction of gravity data, gravity instruments, techniques and field survey, interpretation of gravity data. Electrical method-elementary theory, effect of inhomogeneous ground, electrode configuration, field procedure, interpretation of profiling and sounding data.

3. Petroleum Geology:
   Chemistry of petroleum, formation of oil and gas; generation of hydrocarbon, organic matter in sedimentary basins, diagenesis, catagenesis, kerogen composition and classification. Petroleum migration and accumulation, primary and secondary migrationas and their mechanism. The traps and their classification. The reservoir properties-porosity and permeability, diagenesis with emphasis on clay mineral diagenesis, reservoir continuity and reserve estimation. World's major oil provinces; a brief account of the petroleum geology of Bangladesh.

4. Hydrogeology:
   Origin and occurrence of ground water, rock properties affecting ground water, subsurface distribution of groundwater, geological formations as aquifers, and types of aquifers. Ground water movement, Darey's law, permeability, transmissibility, tracing of ground water movement, ground water flow lines and contours. Ground water exploration, presentation and interpretation of results; determination of aquifer characteristics pumping test. Water wells, well design and well development. Ground water resources of Bangladesh: Problems and Prospects.

5. Mineral Resources:
   Classification of economic mineral deposits; mode of occurrence, controls of ore localisation, formation of ore mineral deposits by magmatic and metamorphic processes including magmatic concertration , hydrothermal processes, contact metamorphism, metamorphic minerals, submarine, exhalative and volcanogenic minerals; Mineral resources of Bangladesh -occurrence, distribution, stratigraphic relationship, reserve and uses of gas & oil, coal, peat, limestone, glass sand, white clay, placer deposits, hard rocks, building materials and metallic minerals.

BOTANY

(POST RELATED)
Subject Code: 581
Total Marks-100

Part-I
Marks: 50

Plant Diversity: Morphology, Anatomy and Reproduction. (Microbiology, Mycology and Plant pathology, Phycology, Higher Cryptogams, Angiosperms, Plant anatomy, Embryology of Angiosperms)

Microbiology:

1. Nature and structure of simple RNA virus (TMV) and DNA virus (T2 Phase), multiplication and transmission.
2. Prion and viroid: Structure, properties and importance.
3. Bacteria: Classification (different types), reproduction, bacterial photosynthesis, transformation and transduction.
4. Economic importance of microbes

Mycology and Plant pathology:

1. Modern classification of fungi and the bases of classification;
2. Economic importance of fungi,
3. Concept and causes of plant diseases,
4. Stages in the development of plant diseases : Inoculation, infection, growth and reproduction of the pathogens, dissemination of pathogens, over-wintering and over summering of pathogens)
5. Control of plant diseases.
6. Symptom, causal agents, disease cycle control measures of the following diseases: i. Blast of rice, ii. Stem rust of wheat, iii. Late blight of potato, iv. Stem rot of jute, v. Red rot of sugarcane, vi. Tungro disease of rice, vii. Panama disease of banana.

Phycology:

1. Modern classification of algae based on different characters.
2. General characteristics of all the major division of algae.
3. Range of vegetative structures in algae.
4. Phytoplankton-General features, biological and economic importance.

Higher Cryptogams:

1. Characteristic features and methods of reproduction with examples.
2. Distribution of bryophyte and pteridophyte genera in Bangladesh with examples.

Angiosperms:

1. Concept about ICN, cytotaxonomy, chemotaxonomy, ecotype and biosystematics.
2. Different systems of classification (i) Artificial; (ii) Natural and (iii) Phylogenetic.
3. Definition and importance of herbarium. Information and activities of world herbaria including Bangladesh.

Plant anatomy:

1. Stele in Pteridophyte
2. Vascular tissue system in angiosperms.
3. Meristem (origin, classification, structure, development and function).

Embryology of Angiosperms:

1. Mega-sporogenesis and Mega-gametogenesis.
2. Micro-sporogenesis and Micro-gemetogenesis.
3. Different types of embryo sac and their development (with examples).

BOTANY

Part-II

Marks: 50

Functions and Applications.

(Plant Physiology and Biochemistry, Cytology and Cytogenetics, Genetics and Molecular Genetics, Tissue Culture, Horticulture, Ethnobotany, Ecology.)

Plant Physiology and Biochemistry:

1. Photosynthesis: Details of C3 and C4 pathways.
2. Comparison between C3, C4 and CAM pathways.
3. Respiration: (i) Aerobic respiration, Glycolysis, (ii) Anaerobic respiration, fermentation with special reference to alcohol fermentation.
4. Physiological and biological nitrogen fixation.
5. Mechanism of salt absorption.
6. Dormancy, Phtotoperiodism and Vernalization.
7. Biosynthesis of some important carbohydrates (a) Sucrose, (b) Starch and (c) Cellulose.
8. Alkaloids: (a) Classification with examples and distribution and (b) importance of alkaloids.
9. Fats: (a) Chemical constitution of fatty acid and (b) Biosynthesis of fatty acid.

Cytology and Cytogenetics:

1. Chromosome: Physical structures.
2. Karyotype and genome analysis.
3. Chromosomal aberrations.

Genetics and Molecular Genetics:

1. Mendel’s Laws of inheritance.
2. Sex determination.
3. Physical structure and chemical composition of DNA and RNA.
4. Plasmid: Structure, function and importance.
5. Recombinant DNA (rDNA): Method of construction and importance.
6. Genetic engineering for crop improvement.

Tissue Culture:

1. Cell suspension culture.
2. Somatic embryogenesis.
3. Haploid production.
4. Clonal propagation and its commercial application.

Horticulture:

1. Classification of fertilizer, composition, doses, application and procedures.
2. Application of growth regulating chemicals in horticulture.

Ethonobotany:

1. Ethno-botanical research in Bangladesh
2. Medicinal plants of Bangladesh, their conservation and sustainable use.

Ecology:

1. Methods of studying vegetation.
2. Ecosystem: (i) Structure and components of ecosystem, (ii) Pond ecosystem.

3. Pollution: Kinds of pollution, harmful effects, effects of dams and embankment on vegetation.
4. Methods of measurement of primary production, Factors limiting primary productivity in aquatic and terrestrial communities.
5. Environmental hazards: Green house effect, ozone depletion, desertification, aridity and drought. Salinity flood and water logging in the light of Bangladesh condition.
6. Different forest types and forest area of Bangladesh, causes of depletion of forests of Bangladesh and the ways and means to prevent it.

ZOOLOGY

(POST RELATED)
Subject Code: 591
Total Marks-100

Part-I
Marks-50

Animal Biodiversity:

(a) Concept of biodiversity.
(b) Classification of major phyla up to classes with diagnostic characteristics and examples.
(c) Morphology, biology and life-history of *Entamoeba, Paramecium* and Eimeria.
(d) Canal systems and affinities of Porifera.
(e) Morphology, reproduction and life-history of *Obelia*. Polymorphism and coral reefs in Cnidaria.
(f) Life-history and parasitic adaptations of *Fasciola hepatica*, and *Taenia solium* and *Ascaris*, Epidemiology and Control measures.
(g) Mode of life and reproduction of *Nereis* and *Hirudo*; Vermicomposting.
(h) Mouth parts of insects, Respiration, Excretion and Metamphosis in insects.
(i) Biology, mode of life and reproduction of Pila and Sepia. Structure and formation of shell in Mollusca, Economic importance of mollusca.
(j) Morphology and reproduction of *Astropecton, Echinus* and *Cucumaria.* Water vascular systems in Echinodermata.
(k) Morphology and mode of life of *Ascidia*, *Branchiostoma*, *Petromyzon* and *Myxine.* Metamorphosis in Ascidia. Affinities of Ascidia.
(l) Morphology, digestive and respiratory system of Scoliodon and *Labeo rohita*. Types of Scales and fins in Pisces.
(m) Mode of life, reproduction and parental care in Amphibians. Economic importance of toad and frogs.
(n) Venomous Snakes and Snake bites, Morphology, habit and habitats of crocodiles and alligators. Dinosaurs.
(o) Flight adaptation, Migration of birds, Flightless birds.
(p) Egg laying mammals and marsupials; aquatic mammals.

ZOOLOGY

Part-II

(GENERAL ZOOLOGY)

Marks-50

Cytology, Genetics and Evolution:

(a) Ultrastructure of an animal cell; Structure and functions of different organelles of cells; Mitosis and miotic cell divisions; Chromosomes.
(b) Nucleic acids; Structures of DNA and RNAs; replication of DNA, transcription of mRNA and translation (Protein synthesis).
(c) Mendelian rations and their modifications, linkages and crossing overs; multiple alleles, blood groups; epistasis; gene interactions.
(d) Genetic engineering, steps in preparing insulin from genetically engineered E. coli.
(e) Evidences of evolution; early theories of evolution; Darwin's Natural Selection theory of evolution, Speciation; allopatric and sympatric evolution.

Ecology:

(a) Ecosystem, food chain, food web; food pyramids, ecosystem of a typical pond.
(b) Causes of environmental degradation; air, Water and Soil pollutions.
(c) Effects of pollution on human health and the economy of Bangladesh.

Wild-life:

(a) Wild-life fauna of Bangladesh; Principles and Significance of wild-life conservation in Bangladesh.
(b) National parks, game reserves and Sanctuaries.
(c) Ecotourism.

Zoogeography:

(a) Zoogeographical regions and their characteristics, bird and mamalian fauna.
(b) Wallace's line and Weaver's line, endemic fauna.
(c) Oriental Region and its relationship with Bangladesh.

Human Physiology, reproduction and population dynamics:

(a) Physiology of digestion, Circulation, respiration and excretion.
(b) Metabolism: Carbohydrate and protein metabolism.
(c) Gametogenesis; ovarian cycle; role of hormones in ovarian cycle; fertilization, implantation, placenta and birth.
(d) Principles of population dynamics; human population and its control strategies in Bangladesh; and principles of birth control practices.

Embryology:

(a) Egg types, fertilization, Cleavage types and gastrulation.
(b) Early embryonic development of *Amphioxus*.

Economic Zoology:

(a) Culture of Carp, Prawn and Shrimps in Bangladesh. Factors responsible in decline of fishery resources in Bangladesh.
(b) Major insect pests of rice, jute, sugarcane and stored products: Biology, nature of damage and control measures of these major pests.

(c) Apiculture and Sericulture in Bangladesh.
(d) Role of mosquitoes in transmission of diseases in human. Malaria eradication and measures of mosquito controls.

BIOCHEMISTRY

(POST RELATED)
Subject Code: 601
Total Marks-100

Part-I
Marks-50

A. Biophysical Chemistry

(i) Atomic structure: Fundamental particles, atomic number, atomic mass, isotopes, relative atomic mass, the mole concept, atomic models, Avogadro constant.

(ii) Periodic property: Periodic table, Mosley's law, ionization potential, electron affinity and electro negativity.

(iii) Gas laws, Ideal gas equation, Kinetic theory of gases, Dalton's law of partial pressure, van der Waals equation.

(iv) Thermodynamics: First and second law of thermodynamics, enthalpy, entropy and free energy change, standard free energy change of chemical and biochemical reactions.

(v) Solution: Types of solution, Collogative properties of solutions, Osmosis and osmotic pressure, Molecular weight determination by the use of osmotic pressure.

(vi) Acids and bases: Brown stead-Lowry concept of acids and bases, Lewis concept, netralisation, indicators, ion product of water, p^H, Buffer, Handerson Hasselbalch equation, biological buffers, buffering capacity.

(vii) Spectrophotometry: Beer-Lambart laws, optical density, standard curve and its use for quantitative determination of biochemical substances.

B. Organic Chemistry

(i) Aliphatic compounds: Hydrocarbon, Alkanes, alkenes, alkynes-their nomenclature, structures, properties and reactions. Alcohols, aldehydes, Ketones, carboxylic acids and derivatives-their nomenclature, structures, physical and chemical properties and reactions.

(ii) Aromatic compounds: Aromatic hydrocarbons, nitrobenzenes, aromatic amines, deazonium salt, phenols-their structures, preparation, properties and reactions.

C. Biomolecules:

(i) Carbohydrates: Nomenclature, classification, structures and important reactions, mutarotation and optical properties. Some important polysaccarides-Starch, glycogen, cellulose, mucopolysaccarides-their structures and functions.

(ii) Proteins: Biological functions of proteins, Classification of amino acids, their structures and properties, essential amino acids, identification of amino acids, classification of proteins, primary, secondary, tertiary and quaternary structures of proteins. Sequencing of proteins.

(iii) Lipids: Classification, biological function, characterization of fat's and oils, essential fatty acids, role of phospholipids, glycolipids and cholesterol in membrane formation. Structures of phospholipids, glycolipids and cholesterol.

(iv) Nucleic acids: Purines and pyrimidines, nucleosides, nucleotides, Classification of nucleic acids-DNA double helix, other structures of DNA. Types of RNA-their structures and functions.

D. Nutrition

(i) Classification of food, importance of carbohydrate, proteins and fat, their energy values. SDA, RQ.

(ii) Balanced diet chart for different physiological condition, nutritional diseases and nutritional status of people in Bangladesh.

(iii) Vitamins: Classification, structures, dietary sources, recommended daily allowances, deficiency symptoms and functions of different vitamins. Coenzyme activity of Vitamin B Complexes.

(iv) Minerals and trace elements: Biochemical functions, sources, daily requirements and deficiency symptoms.

BIOCHEMISTRY
Part-II
Marks-50

A. Intermediary Metabolism:

(i) Enzymes, characteristics, classification, active sites, enzyme activity units, factors affection enzyme activit, Michaelis-Menten equation, significances of Km and Vmax, Inhibition of enzymes, Allosteric enzymes.

(ii) Carbohydrate Metabolism: Glycolysis, TCA cycles, Pentose phosphate pathway-their regulation and energetics. Gluconeogenesis.

(iii) Lipid metabolism: Detradation of triglycerides and phospholipids, oxidation of fatty acids, ketone bodies, production of energy by complete oxidation of palmatic acid, fatty acic biosynthesis and its regulation, biosynthesis of cholesterol.

(iv) Protein Metabolism: Outline of metabolism of amino acids by transamination, deamination and decarboxylation, glucogenic and ketogenic amino acids, urea cycles.

B. Physiology:

(i) Blood: composition, function, blood cells, blood grouping, Heart structure and coronary heart diseases.

(ii) Digestion: Dtructure of the gastrointestinal tract, composition of digestive juices, Digestion and absorption of carbohydrates, proteins and fat.

(iii) Structure and functions of liver, lung and kidney.

C. Endocrinology:

Classification of hormones, mechanism of hormone actions, synthesis, physiological functions and biochemical functions of Pituitary, thyroid, parathyroid, pancreatic and gonad hormones.

D. Clinical Biochemistry:

1) Diagnostic importance of ALT, AST, CK, LDH, acid phosphotase, alkaline phosphotas, urea, uric acid, billirubin, glucose, cholesterol, calcium ion, iron ion, phosphate and bicarbonate ion. Genetic basis of some Biochemical disorders-phenylketonuria, alkaptouria, sickle cell anemia, thalsamia, gout.
2) Biochemistry of some diseases: Diabetes, Jaundice, Cholera, Diarrhoea.

E. Molecular Biology:

(i) DNA replication, Structure of m-RNA. Transcription, structures of t-RNA and ribosomes, Translation, Genetic code, Mutation, DNA sequencing, Northern blotting, Southern blotting and Western blotting.

(ii) Restriction enzymes, Vectors, DNA ligase, Cutting and joining of DNA, cDNA, reverse transcriptase, transformation. Host control restriction and modification, cloning of particular gene in different vectors, Polymerase chain reaction (PCR), Human Genome Project.

(iii) Regulation of Gene expression, Lac operon and arabinose operon, catabolic repression.

SOIL, WATER AND ENVIRONMENT SCIENCE

(POST RELATED)
Subject Code: 621
Total Marks-100

Part-I
Marks- 50

Soil formation: Soil forming materials–rocks and minerals primary and secondary minerals; silicate and non minerals; clay minerals – their formation and importance weathering of rocks and minerals; soil profiles and pedons; formation of soil horizons; master horizons and diagnostic horizons; factors of soil formation; important soil forming processes; major soil groups of the world.

Physical properties of soil: Soil as a three – phase disperse system; mass and volume relationship of soil constituents; soil texture; soil structure – classification, evaluation, management and importance; soil water – energy state of soil water, soil water potential; retention and movement of water in soil; concepts of available water; soil air and soil temperature.

Irrigation and drainage: Sources and quality of irrigation water; methods of irrigation; irrigation requirements of major crops of Bangladesh; irrigation projects in Bangladesh; drainage – types and benefits.

Soil survey and soil classification: Different types of soil survey; techniques of soil survey; agricultural and non agricultural uses of soil survey data; soil Taxonomy; properties and uses of soil orders.

Land evaluation: Concept of land evaluation; techniques and importance of land evaluation; land use planning.

Soil of Bangladesh: General condition of soil formation in Bangladesh; nature of soil forming factors; dominant soil forming processes; characteristics of major soil groups; agro ecological zones of Bangladesh.

SOIL, WATER AND ENVIRONMENT SCIENCE

Part-II
Marks- 50

Chemical properties of soil: Chemical composition of inorganic components of soil; humus – its characteristics and importance; soil solution – composition and importance; ion exchange in soil – origin of ion exchange properties, ion exchange capacities of various soil constituents, importance; soil reaction – measurement of soil acidity, importance of soil pH; liming of acid soil; non – biological fixation of N, P, and K in soil.

Biological properties of soil: Macro microorganisms in soil – their morphology, structure and classification; factors affecting microbial growth in soil; nitrogen and sulphur transformation in soil; biological N2- fixation; bio-fertilizer.

Soil fertility and plant nutrition: Concepts of soil fertility and soil productivity; essential nutrient elements – macro – and micronutrients; physiological function of N,P and K; fertilizers – sources, types and grades; fertilizer law; diagnosis of fertilizer needs in soil; methods of fertilizer application; residual effects of fertilizer; manures and compost; nutrient status and fertilizer needs of different AEZ of Bangladesh.

Soil pollution: Sources of pollutants in soil; effects of soil pollution on ecosystem and food quality; permissible limits of heavy metals in soil, plants, sewage sludge, city wastes, irrigation water, industrial wastes and effluents; waste management.

Soil degradation and conservation: Types and processes of soil degradation; assessment of soil degradation; soil quality – concept and assessment; soil conservation and reclamation – principles of soil conservation; agronomic and mechanical practices of soil conservation.

FOOD AND NUTRITION

(POST RELATED)
Subject Code: 661
Total Marks-100

Part-I
Marks- 50

1. Definition of Nutrition, Health and Malnutrition:
(a) Relation of nutrition and health.
(b) Major nutritional problems of Bangladesh- PEM, micronutrient malnutrition.
(c) Classification and functions of nutrients.

2. Carbohydrates:
(a) Classification, chemical nature, source and functions of different types of carbohydrate- simple and complex carbohydrates.
(b) Functions of dietary fiber.

3. Proteins:
(a) Classification, chemical nature and sources of different proteins.
(b) Essential amino acids.
(c) Functions and deficiency of proteins in the body.

4. Fats and fatty acids:
(a) Classification and chemical nature of different fats in the body.
(b) Essential fatty acids- Omega 3 and Omega 6 fatty acids- their role in nutrition.
(c) Disadvantage of excess fat intake.

5. Vitamins:
(a) Classification, chemical nature and food sources.
(b) Co-enzyme functions of vitamins.
(c) Deficiency of vitamins in the body.

6. Minerals- their physiological roles- functions and food sources:
(a) Major minerals
(b) Minor Minerals

7. Energy intake and expenditure:
(a) Measurement of energy expenditure.
(b) Factors influencing energy requirement.
(c) Calculation of ones energy requirement.

8. Enzyme and hormones:
(a) Classification and chemical nature of different forms of enzyme and hormones.
(b) Physiological role and disease states of hormones action.

9. Metabolism of carbohydrate, fats and proteins:
(a) Glycolysis, TCA cycle, fatty acid oxidation, deamination and transamination.
(b) Inborn errors of metabolism- Glycogen storage disease, fructosuria, phenylketonuria etc.

FOOD AND NUTRITION

Part-I I

Marks- 50

1. Approximate composition of common food stuffscereals, meat, fish, eggs, milk, pulses and legumes, nuts and oil-seeds, vegetables and fruits.

2. Nutrition during normal life cycle:

(a) Pregnancy and lactation- nutrition requirement, effect of malnutrition during pregnancy.

(b) Infancy and early childhood- nutritional requirement breast-feeding and weaning.

(c) Elderly- health problem and nutritional modification of adult diet for old people.

3. Assessment of nutritional status of community:

(a) Types of assessment- anthropometry, clinical, biochemical, dietary assessment and surveys.

(b) Advantage and disadvantages of each type.

4. Concept and importance of nutrition education:

(a) Objectives of nutrition education and implementing nutrition education program in a community.

(b) Use of audio-visual aids in nutrition education.

5. Community based approaches to solve nutritional problems:

(a) Improving household food security.

(b) Food fortifications and supplementation.

(c) Promoting appropriate dietary guidelines.

6. Causes, symptom and nutritional management in-

(a) Diarrhea;

(b) Constipation;

(c) Diabetes mellitus;

(d) Hypertension;

(e) Liver and kidney diseases.

7. Food additives and Food Preservation:

(a) Classification of food additives and their uses in food industry.

(b) Method of food preservation- heating, refrigeration, drying, use of chemicals, irradiation, pasteurization, canning, bottling, jams, pickles etc.

(c) Causes of Food spoilage.

8. Antioxidant in health and nutrition:

(a) Chemical nature and sources of anti-oxidants.

(b) Role of anti-oxidants in detoxification of the body.

(c) Free radials and oxidative stress.

9. Micronutrient malnutrition in Bangladesh:

(a) Prevalence of vitamin A deficiency, IDD and anaemia.

(b) Steps and measures to remove micronutrient malnutrition among the population.

(c) Importance of nutritional rehabilitation for the vulnerable group.

ACCOUNTING
(POST RELATED)
Subject Code: 701
Total Marks-100

Part-I
Marks: 50

Financial Accounting:

1. Introduction-Definition of Accounting, Objective, Need and Importance of Accounting, Users and Uses of Accounting Information. Brief History of Accounting, GAAP-Operating Guidelines. Basic Accountings Equation-International Accounting Standards-Accounting Profession.
2. The Recording Process-The Account-Rule of Debit and Credit, Expansion of Basic Equation, Journal, Ledger, Trial Balance, Adjusting Entries, Closing Entries, Correcting Entries, Work Sheet, Closing Entries, Financial Statement Preparation for Sole Proprietorship and Companies.
3. Inventory Accounting System-Perpetual & Periodical-Valuing Inventory at the Lower of Cost or Market (LCM).
4. Internal Control-Cash & Bank, transactions -Bank Reconciliation Statement.
5. Depreciation-Definition, factors and methods of changing deprecation.
6. Cash flow statement-Importance-Preparation of cash flow statement.
7. Accounting for Common stock Issue, Treasury Stock and Preferred Stock, Dividends and Retained Earnings-Bonus Shares or Stock Dividend.
8. Elementary Idea about Integrated Accounting System as practised in the sector Corporations in Bangladesh.
9. Elementary Idea about Social and Government Accounting-Feature of Government Accounting-CAG, his functions-Annual Account-Departmentation of Accounts.
10. Environmental or Green Accounting.
11. Financial Statement Analysis-Use and limitations-Vertical & Horizontal Analysis.

ACCOUNTING
Part-II
Marks: 50

A. Cost Accounting:

1 Introduction: Meaning, Objective, Function and Importance of Cost Accounting. Financial Accounting Vs Cost Accounting. Methods & Types of Costing. Elements of Cost, Statement of Cost, Cost Concept, Cost classification. cost Accounting Vs Management Accounting
2 Accounting for materials, labor and overhead.
3 Accounting procedures for Job, Batch and Contract Costing.
4 Accounting Procedures for Process for Costing-Valuation of Work-in-Progress. Equivalent Production, Costing for By-Product & Joint Product.
5 Budgetary Control and Elementary Idea of Standard Costing.

B. Auditing:

1. Introduction: Objective, Advantage, Procedures and Techniques of Auditing, Audit Program, Various Modes of Conducting Audit.
2. Errors & Frauds-Nature & types, Auditors duty, Preventive Measures.
3. Internal Audit-Internal check and internal control-Object, Procedures & Auditors Position.
4. Vouching-Verification and Valuation of Assets and Liabilities-Auditors Duties & Liabilities.
5. Auditing standards and Auditing Profession in Bangladesh.

C. Income Tax:

1. Principles of Public Finance-Objective of Taxation. Types of Taxes in Bangladesh, Incidence shifting of Burden-Internal Resources mobilization.
2. Income for Tax Purpose, Characteristics, Classifications and Heads of Income.
3. Assessment procedure of Income Tax for Individuals and companies.
4. Income Tax Authority in Bangladesh.

FINANCE
(POST RELATED)
Subject Code: 711
Total Marks-100

Part-I
Marks: 50

Business finance-nature objectives-scope of Business Finance goals and functions of business finance-Financial Manager-Controller and Treasurer Functions-Sources of financial Information-Sources of short term. Intermediate term and long term financing.

Corporate Planning and financial Management-Funds Flow Analysis-Approaches to Financial Forecasting-Managing Cash Position-Management of Working Capital-Capital Budgeting-Cost of Capital Structure Theory-Financial Leverage-Planning the Capital Structure-Corporate Taxes-Personal and Corporate Taxes.

Ratio Analysis-Time-series Analysis-Projection of Financial Requirements-Pro-forma Statements-Role of Financial Markets-Primary and Secondary Securities Market-Dividend policy-Issue of Bonus Shares-Right share-Valuation of Share.

Insurance Meaning-Objectives of functions-Types-Life, Property and others-Principles of insurance : Insurable interest, Indemnity, Subrogation, Contribution, Utmost Good Faith, Proximate Course; Reinsurance; Insurance marketing; Insurance pricing; Insurance in Bangladesh-Insurance Corporations and Private Insurance Company Operations in Bangladesh.

Financial Institution-BSB. BSRS and ICB-Operation of Securities Exchange Commission and Stock exchange in Bangladesh.

FINANCE
Part-II
Marks: 50

Need for Banks and Banking-Commercial and Central Banking-Banker-customer relationship-Negotiable Instrument Act-Comparative Banking-Fund Management and Measures of Performance of Banks.

Deposit Management-Capital Management- Management of Reserves-Liquidity Management-Loans and advances, Cash Credit, Overdrafts-Loan Management-Loan policy, Tools of credit analysis-Classification of loans-Problem loans, symptoms, causes and remedies of problem loans.

Financial Service Consumer-Identifying and Targeting Financial Prospects-Development and Management of Financial Products-Pricing of Financial Service-Islamic Banking-Mode of Investment-Characteristics of

Rural Economy of Bangladesh-Need for Funds in Rural Areas-Role of Rural Credit-Micro Finance-sustainability of micro finance-Foreign Exchange Reserve Management-Banking

Reforms committee recommendation-Regulatory Arrangement of Bank-Impact of Regulation and Supervision of Financial Institutions-Investment Management of Bank Funds.

Electronic Banking-Opportunities, Legal Framework-e-payment Systems; Cheques Collections, Debit and Credit Cards, Lock Box, Clearing House-ATM and Tele Banking Banking system in Bangladesh - Bangladesh Bank-Nationalized Commercial Banks-Private Commercial Banks and Development Bank Operations in Bangladesh.

MARKETING
(POST RELATED)
Subject Code: 721
Total Marks-100

Part-I
Marks: 50

Introduction:
Definition of Marketing, Core Marketing Concepts, Company Orientation Toward the Marketplace : The Production concept, The Product Concept, The Selling Concept, The Marketing Concept, The Customer Concept, The Societal Marketing Concept, The Application of These Concepts in Bangladesh.

Scanning the Marketing Environment: Actors of Microenvironment, Analyzing Needs and Trends in the Macro environment, Identifying and Responding to the Major Macro environment Forces: Demographic, Economic, Natural, Technological, Political-Legal, Social-Cultural.

Segmenting, Targeting, and Positioning: Market Segmentation: Definition of Market Segmentation, Levels and Requirements for Effective Market Segmentation, Bases for Segmenting Consumer and Business Markets.

Target Marketing: Evaluating Market Segments, Selecting Target Market Segments.
Positioning by Competitive Advantage: Choosing a Positioning strategy, Communicating and Delivering the Chosen Position.

Product, Services, and Branding:
Product: Definition, Levels of Product, Product Classifications, Product Mix, Definition, Stages, and Strategies of Product Life Cycle.
Services: Definition, Characteristics and Marketing Strategies for Service Firms.
Branding: Definition, Brand-Name Decisions, Brand Strategy Decisions: Line Extension, Brand Extension, Multi brand, New Brand.
Pricing Approaches and Strategies:
Pricing Considerations and Approaches: What is a Price? Factors to Consider When Setting Prices, General Pricing Approaches.

Pricing Strategies: New-Product Pricing Strategies, Product Mix Pricing Strategies, Price Adjustment Strategies, Initiating and Responding to Price Changes.

Advertising, Sales Promotion, and Public Relations:
Advertising: Definition, Setting Advertising Objectives, Setting the Advertising Budget, Developing Advertising Strategy, Evaluating Advertising.

Sales Promotion: Definition, Sales Promotion Objectives, Major Sales Promotion Tools, Developing the Sales Promotion Programs.

Public Relation: Definition, the Role and Impact of Public Relations, Major Public Relation Tools.

Marketing Channel and Supply Chain Management: Supply Chain and Value Delivery Network, The Nature and Importance of Marketing Channel, **Channel Behavior and Organization:** Vertical and Horizontal Marketing Systems, Multi channel Distribution

Systems, **Channel Management Decisions:** Selecting, Managing, Motivating and Evaluating Channel Members.

Marketing in Bangladesh: Marketing Problems and Prospects of Consumer Products in Bangladesh, the Role and Functions of BSTI, EPB, EPZ and Stock Exchange in Marketing in Bangladesh.

MARKETING
Part-II
Marks: 50

Managing Integrated Marketing Communications: The Communication Process, Developing Effective Communications: Identify the Target Audience, Determine the Communication Objectives**,** Design the message, Select the Communication Channels, Establish the Total Marketing Communication Budget, Deciding on the Marketing Communication Mix: The Promotional Tools, Factors in Setting the Marketing Communications Mix, Measure the Communications' Results, Managing the Integrated Marketing Communications Process.

Personal Selling and Direct Marketing:
Personal Selling: Definition, Steps in the Selling Process, Personal Selling and Customer Relationship management.

Direct Marketing: Definition, Growth and benefits of Direct Marketing, Forms of Direct Marketing, Integrated Direct Marketing, Catalog Marketing, Telemarketing and E-Commerce.

Company and Marketing Strategy: Definition of strategic Planning, Defining a Market-Oriented Mission, Setting Company Objectives and Goals, Designing the Business Portfolio, Planning Marketing: Partnering to Build Customer Relationship, Marketing Process, Managing the Marketing Effort.

Creating Competitive Advantages:
Competitor Analysis: Identifying Competitors, Assessing Competitors, Selecting Competitors to Attack and Avoid, Designing a Competitive Intelligence System.
Competitive Strategies: Approaches to Marketing Strategy, Basic Competitive Strategies, Competitive Positions, Market Leader Strategies, Market Challenger Strategies, Market Follower Strategies, Market Nicher Strategies.

Developing New Market Offerings : Challenges in New-Product Development, Organizational Arrangements:
Budgeting for New-Product Development, Organizing New-Product Development, Managing the New-Product Development: Ideas, Idea Screening, Managing the Development Process: Development to Commercialization, Product Development, Market Testing, Commercialization, The Consumer-Adoption Process: Stages in the Adoption Process, Factors Influencing the Adoption Process.

Designing Global Market Offerings:
Competing on a Global Basis, Deciding Whether to Go Abroad, Deciding Which Markets to Enter: How Many Markets to Enter, Regional Free Trade Zones, Evaluating Potential Markets, Deciding How to Enter the Market: Indirect and Direct Export, Licensing, Joint Ventures, Direct Investment, The Internalization Process, Deciding on the Marketing Program**:** Product.

Managing Retailing, Wholesaling and Market Logistics:
Retailing: Types of Retailers, Marketing Decisions, **Wholesaling:** Types of Wholesaling, Wholesaler Marketing Decisions, Market Logistics: Market-Logistics Objectives, Market-Logistics Decisions, Organizational Lessons.

MANAGEMENT

(POST RELATED)
Subject Code: 731

Total Marks-100

Part-I

MANAGEMENT (BASIC)

Marks: 50

Introduction	:	Definition of management, concepts, phases of development, importance, functions, principles, managerial skills, organization.
Scientific & Modern Management	:	Concepts and importance, different aspects of scientific management, results of Taylor's experiment, merits and demerits of scientific management, features of modern management, Fayol's principles of modern management.
Corporate Management	:	Separation of ownership and professional management, methods of company management, board of directors, size, qualification, methods of appointment, functions, duties and responsibilities, powers, code of conduct, corporate executive and chief executive officer(CEO).
Office Management	:	Importance, methods of office Management, co-ordination of various departments, filing and indexing, preparation of reports and Commercial documents, Meetings and resolutions, company/ corporate secretary.
Human Resource Management	:	Importance, selection and recruitment of staff, training, appraisal, Compensation, promotion, termination, retirement, personnel administration.

Part-II

MANAGEMENT (PROCESS)

Marks: 50

Introduction	:	Management thought, management and society, social responsibility, ethics, internal and external environment of organization, managing change, comparative management.
Planning	:	Importance, nature, purpose, types, steps, objectives, managing by objectives (MBO), strategic planning, decision making.
Organizing	:	Nature, formal and informal organization, Span of management, departmentation, organization structure, Line and staff concepts, delegation of authority, centralization, decentralization and re-centralization.
Leading	:	Managerial leadership, various approaches, leadership behavior and styles, situational leadership, motivation and motivators, various motivation theories and application, two-way communication.
Controlling	:	Basic control process, feedback and feed forward control, effective control, control techniques, Budgetary and non-budgetary control, preventive control, management audit.

AGRICULTURE
(POST RELATED)
Subject Code: 801
Total Marks-100

Part-I

Marks-50

a) Production technology and costing of field crops- rice, wheat, maize, jute, sugarcane, tea, tobacco, lentil, groundnut, soyabean and mustard. External morphology and desirable qualities of these crops.

b) Production technology of horticultural crops-Banana, papaya, pineapple, potato, tomato, cabbage, cauliflower, brinjal, onion, garlic and chili. Post-harvest management (e.g. processing and storage) of these crops.

c) Importance of irrigation and drainage for crop production. Merits and demerits of different methods of irrigation. Irrigation seedling in crops. Quality of irrigation water in relation to crop production and soil condition.

d) Crop nutrition and fertilizer management: sources and available forms of plant nutrients, fertilizer and manners, judicious application of fertilizers and organic matters in different agro-ecological zones (AEZ) of Bangladesh. Use of Bio-fertilizers in agriculture and water management utilization of agriculture wastes. Scope and importance of bio energy, and generation of Bio-gas.

e) Major insect pests and diseases of rice, wheat, jute, sugarcane, potato and mango and their control measures.

f) Pesticides - their formulation, mode of action, methods of application residual effects with safety measures. Economic injury level and LD50. Integrated pest management (IPM) -concept, prospects and limitations.

g) The principles and practices of agricultural extension with special emphasis on program planning, transfer of technologies, communication, diffusion and leadership. Importance of rural youth, rural women and landless farmers in agricultural extension and their empowerment.

AGRICULTURE

Part-II

Marks-50

i) Plant genetic resources (PGR) -diversity of PGR and their conservation methods.

ii) Crop improvement- introduction, selection, hybridization and mutation breeding. Development of hybrid and modern varieties (MVs). Concepts of variety Act and intellectual property right (IPR), seed certification and variety release.

iii) Bio–technology in Agriculture: Tissue culture, genetic engineering. GMO and bio–safety regulations-environmental, social, legal and ethical issues.

iv) Plant growth regulators, growth retardants and phytohormones. Ripening chemicals-uses and abuses.

v) Concept and significance of seed viability and seed vigor. Testing seeds for purity, moisture, germination and vigor. Principles of seed crop production.

vi) Weed competition and factors affecting crop-weed competition. Allelopathic effects of weeds on crops and vice-versa. Herbicidal weed control in rice, jute, cotton and sugarcane. Integrated Weed Management (IWM).

vii) Environmental degradation and pollution (soil, water and air pollutions)-causes and impact on Bangladesh Agriculture. Management of drought, flood and soil salinity and other current environmental issues.

viii) Concept and scope of agro-forestry, present status of forest resources in Bangladesh, possible improvement of present land use system through sustainable agro-forestry. Multistoried tree production system, hill cultivation-SALT practices and their different models.

ix) Economic importance of fiber, oil, timber, medicine, rubber, narcotic and beverage crop plants and their products. Tapping system, composition and latex coagulation of rubber. Manufacturing process and changes in chemical composition in tea leaves.

MARINE SCIENCE
(POST RELATED)
Subject Code: 861
Total Marks-100

Part-I
Mark-50

Marine Ecology:

a. Major ecological division of marine environment and its related flora and fauna;
b. floral and faunal study of sandy, muddy and rocky shore (St. Martin's Island, Kutubdia Island, Moheshkhali Island, Sonadia Island);
c. Energy flow in the marine environment
d. Biogeochemical cycle in the coastal and marine ecosystem.

2. Mangrove Ecosystem:

(i) Occurrence and distribution of mangrove;
(ii) Habitat;
(iii) Ecological role;
(iv) Economic role;
(v) Flora and fauna of mangrove forest;
(vi) Afforestation and deforestation;
(vii) Problem in the mangrove forest (top dying disease, sedimentation).

3. Seaweed:

i. Occurrence and distribution;
ii. Habitat;
iii. Ecological role;
iv. Biology of seaweed;
v. Economic role;

4. Estuarine and Coastal Process:

i. Definition and general characteristics;
ii. Types of estuaries;
iii. Human activities and their implications;
iv. Port and harbor activities;
v. Dredging and waste disposal;
vi. Fishing;
vii. Study of the estuaries of Bangladesh (Karnafully river estuary, Pashur river estuary, Meghna estuary).

5. Oceanography:

a. Global distribution of land and water;
b. Physical-chemical properties of sea water;
c. Tide, wave & current of the Bay of Bengal;
d. Different elements in sea water (major, minor, trace and radioactive);
e. Dissolved gases & nutrient distribution in sea water;
f. Marine natural products chemistry;
g. Importance of Plankton (Phytoplankton, Zooplankton);
h. Hydrocarbon resources of the Bay of Bengal & its commercial uses.

6. Navigation and Communication:
    a. Navigation equipments:
        I. Magnetic
        II. Gyro compass
        III. Sextant
        IV. Radar

    b. Means of communication :
        I. Signaling in morse code by light
        II. Sound signal
        III. International code of signals by code flags
        IV. Semaphore
        V. Wireless communication

    c. Ship hygiene and safety precaution
        I. Ship hygiene
        II. Fire fighting and life saving appliances
7. Environmental Pollution:
    a. Types of marine pollution;
    b. Oil pollution and its impact on marine environment ;
    c. Green house gases and effect;
    d. Eutrophication;
    e. International convention for the protection of marine environment; (MARPOL/SOLAS) & biodiversity (CBD);
    f. Impacts of development activities: Farakka barrage & Flood protection; embankment, destruction of mangrove forest due to coastal aquaculture, human interferences in St. Martin coral island.

MARINE SCIENCE

Part-II

Marks-50

1. Fish biology :

a. Biology of commercially important fin and shell fishes of marine and coastal water of the Bay of the Bengal (Physiology, Feeding , Breeding, Life cycle, Migration, Seasonal Occurrence, Abundance, Distribution, Biodiversity)

b. Stock assessment methods and population dynamics of fin and shellfish of the Bay of Bengal.

c. Crafts and gears used in the Bay of Bengal.

2. a. Marine Invertebrates & Chordates:

1. Classification and salient features of marine invertebrates of the Bay of Bengal.
2. Classification and geographical distribution of marine chordates with special reference of fishes of the Bay of Bengal.

b. Integrated Coastal Zone Management (ICZM):

1. Definition and objectives of ICZM, multiple uses & issues of coastal zone anagement, tools for coastal zone management plan.

3. Hatchery operation and management:

a. Breeding criteria of marine species under controlled condition;
b. Hatchery facilities and equipments;
c. Hatchery design;
d. Water quality management;
e. Brood stock transportation;
f. Hatchery techniques;
g. Phytoplankton culture(Skeletonema costatum, Tetraselmis, Chlorella);
h. Rotifer culture;
i. Artemia production;
j. Fry transportation and marketing.

4. Culture of marine species:

a. Fish culture (Tilapia, Pangus, Mullet, Seabass);
b. Shrimp (Peneaus monodon) farming;
c. Prawn (Macrobrachium rosenbergii) farming;
d. Pond and cage culture of crab;
e. Mollusk culture;
f. Seaweed Caulerpa racemosa, Hypnea spp.) farming;
g. Fish and shrimp nutrition;
h. Disease of cultured species (fish and shrimp);
i. Feed preparation;

5. Processing and microbiology:

a. Processing and preservation of marine species (fish,shrimp, crab);
b. spoilage of fish shrimp and control methods;
c. Detection and isolation of pathogenic organisms.

6. Marking of cultured species:

a. Local and international market;
b. Value chain;

c. Future possibility.

7. Sustainable Aquaculture in Bangladesh:

a. Introduction to sustainability;
b. Environmental interactions :
   i. Impacts of the environment on aquaculture
   ii. Impacts of aquaculture on the enviornment
c. Nutrient load of aquaculture
d. Government policy on shrimp culture
e. Organic aquaculture :
   i. Definition
   ii. Importance of organic aquaculture
   iii. Practice of organic aquaculture in Bangladesh

ELECTRICAL AND ELECTRONICS ENGINEERING
(POST-RELATED)
Subject Code: 892
Total Marks: 100

Part- I
Marks: 50

1. **Electrical Circuits**

The Basic Electrical Circuit Elements: Response of Basic R, L, and C, Average Power and Power Factor, Phasor.
Methods of Circuit Analysis (DC & AC): Ohm's Law, Nodes,Kirchhoff's Laws, Independent versus Dependent Sources, Source Conversions, Mesh Analysis, The Supermesh, Nodal Analysis, Delta-WyeConversion.
Network Theorems (DC & AC): Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem
RC, RL and RLC Circuits: RC and RL High-Pass, Low-Pass Filters, Band-pass, Series and Parallel RLC Resonances.
AC Power and Polyphase Circuits: Apparent Power, Power Factor and Complex Power, Polyphase Systems, Single-Phase Three-Wire Systems, Three-Phase Y-Y Connection, The Delta Connection Power measurement in Three-Phase Systems.

2. **Electrical Machines and Transformers**

Introduction: Leakage Flux, Faraday's Laws of Electromagnetic Induction, Induced EMF, Self and Mutual Inductance, AC Excitation in Magnetic Circuit, Eddy Current Loss.
DC Generator: Basic Construction, Simple Loop Generator, Commutator, Armature Coils, Brushes, Armature Winding, Characteristics of Lap and Wave Winding, EMF and Torque Equation, Armature Reaction, Methods of Commutation, Types of DC Generators, No-load and Load Characteristics of Shunt, Series and Compound Generators, Losses and Efficiency of DC Generators.
DC Motors: Working Principle of DC Motors, Back EMF and EM Torque, Series and Shunt DC Motors, Starting of Shunt and Compound Wound DC Motors, Speed Control of DC Motors, Electrical Braking of DC Motor, Losses in DC Motor, Efficiency of DC Motor.
Synchronous Generators: General Aspects and Principles of Synchronous Machines, Generator and Motor Action, Alternating EMF, Relation between Frequency, Speed and Number of Poles, Constructional Features of Synchronous Machines, Equivalent Circuit and Phasor Diagram, Voltage Regulation, Losses and Efficiencies in Synchronous Generators, Parallel Operation of Alternators, Synchronising Single and Three Phase Alternators and Synchronising Current, Power and Torque.
Synchronous Motors: Construction, Working Principle and Equivalent Circuit of a Synchronous Motor, Phasor Diagram, Relation between Supply and Excitation Voltage, Torques in a Synchronous Motor, Power Flow in Synchronous Motor, Effect of Load and Excitation Change,
Three-Phase Induction Motors: Constructional and Operational Principle, Slip, Speed of Rotor Field, Rotor EMF, Resistance, Reactance, Impedance, Current and Power Factor, RotorEquivalent Circuit, Stator Parameters, Induction Motor on No-load and on Load, Constant and Variable Losses, Power Flow, Rotor Efficiency, Torque Development, Effect of Load and Voltage on Torque, Torque-Slip Curve, Stator Resistance, Voltage-Ratio Test, No-load Test, Blocked Rotor Test.

Starting and Speed Control Methods: Squirrel Cage Induction Motors, Slip-Ring Induction Motors, Starting Methods of Squirrel Cage Induction Motors, Speed Control by Changing the Slip, Rotor Circuit Resistance, Supply Voltage, Voltage in the Rotor Circuit, Supply Frequency, Changing the Poles, and Rotor EMF Injection.

Single-Phase Induction Motor: Classification of Single-Phase Motors, Single Phase Induction Motors, Torque and Field in Single-Phase Induction Motors, Equivalent Circuit, Methods of Self-Starting.

Stepper Motors: Permanent Magnet and Variable Reluctance Type.

Transformers (single phase): Working Principle of a Transformer, Core Material and Construction, Transformer Winding, EMF Equation, An Ideal Transformer, Transformer on No-load and Load, Transformer Winding Resistance, Mutual and Leakage Fluxes, Equivalent Reactance, Equivalent Circuit for an Actual Transformer, Voltage Regulation, Losses in a Transformer, Efficiency of a Transformer, Transformer Tests: Open-circuit or No-load Test, Short Circuit Test, Auto-transformer.

Transformers (three phase): Merits and Construction of Three Phase Transformer, Relative Primary and Secondary Windings, Polarity of Transformer Windings, Phasor Representation, Three-Phase Transformer Connections, Selection of Transformer Connections: Star-Star, Delta-Delta, Star-Delta Connections, Delta-Star and Delta-Zigzag, Parallel Operation of Three-Phase Transformers, Open-Delta or V-V and T-T Connections

3. **Power System**

Overview of Modern Power Systems: Generations, Transmissions and Distributions.

Representation of Power Systems: Single-Line Diagram, Per-Unit Methodology.

Modelling Circuit of Power System Components: Transformers, Generators, Loads, Current-Voltage Relationships on Transmission Line: Representation of Lines, Short Transmission Line, Medium-Length Line, Long Transmission Line, Power Flow through a Transmission Line.

Power System Fault Calculations: Symmetrical Components, Symmetrical Faults: Transients in RL Series Circuits, Internal Voltages of Loaded Machines,
Under Fault Conditions, Fault Calculations using Z-Bus, Unsymmetrical Faults: Unsymmetrical Faults on Power System, Single Line-to-Ground Faults, Double Line-to-Ground Faults, Open-Conductor Faults.

Power Transmission/Distribution Paths: Overhead Transmission Lines, Underground/Underwater Cables, and their Mechanical Designs.

Power System Stability: Overview on Steady-State and Dynamic Behaviour of Power Systems, Classification of Stability, Rotor Angle Stability- Swing Equation, Power Angle Equation, Equal Area Criterion, Multi-Machine System, Factors
Affecting Stability.

Flexible AC Transmission System (FACTS): Introduction, SVC, STATCOM,
SSSC, TCSC, TCSR, TCPST, UPFC, IPFC, DVR.

High Voltage DC (HVDC) Transmission System: Types of HVDC, Its Components and Operations.

Switch Gear and Protection:

Circuit Breakers: Significance of switchgear and protection in power system, Principle of arc extinction in DC and AC circuit breakers, Re-striking voltage, Recovery voltage, Rate of rise of recovery voltage, Resistance switching, Current chopping and interruption of capacitive current, Types, construction and operating mechanisms of air circuit breaker (ACB), Oil circuit breaker (OCB), Vacuum circuit breaker (VCB) and sulfur hexafluoride (SF6) circuit breaker, Rating and selection of power circuit breakers, Testing of high voltage circuit breakers.

Protective Relays: General requirements, Relay operation principles, Construction of relays, Relay currents and voltages, Use of instrument transformer for relays, Problem of

high speed relaying transmission lines, Operating characteristics of different types of relays: DMT and IDMT relays, Overcurrent relay, Directional relay, Differential relay, Impedance relay, Reactance relay, Mho relay, Modified impedance relay, Zero sequence and negative sequence relays, Balance current relaying of parallel line, Ground fault relaying, Pilot relaying principles, Carrier pilot relay, Apparatus protection, Circuits and relay setting, Generator and motor protection, Transformer protection, Busbar protection, Line protection, HVDC system protection.

4. **Power Plant Engineering**

Thermal, Steam, Hydroelectric barge mounted, Nuclear power plant load curves, Estimates of load, Load curves, Study and analysis of load curves, Interpretation of load curves, Determination of actual demand and capacity of various components in a system, Plotting the expected load curve of a system, Use of the load curves, Load growth and extrapolation of load curves, Selection of plant, Effect of variable load on power plant design, Continuity of service requirements and its effect on plant design, Cost consideration, Equations of performance for plant equipment and electric service, Selection of units, Standby units, Large and small units, Number and sizes of units, Plant location, Considerations for site selection for different types of plants, General considerations for different types of power plants: large, medium and small, conventional and nuclear. Introduction to Non-conventional Renewable Energy Conversion: Solar, Wind and wave electric energy converters.

Renewable Energy: Wind turbine generators, Construction & basic characteristics of solar cells, Photovoltaic systems, Fuel cells, Hybrid systems, Tidal energy, Biogas & biomass energy. Economic marginal transmission cost, Graphical solution for location of different types of distribution, Rectangular distribution of loads, Economic conductor selection and general consideration, The ideal conductor, Effect of any deviation from the ideal cross-section, Limits for size of underground cables, Selection of ideal supply voltage, Plant performance and operation characteristics, Performance characteristics, Efficiency, Heat rate, Incremental rate method, Station performance characteristics, Station incremental rate, Capacity scheduling, Base load and peak load, Load division between steam and hydro stations, Bus system, Importance of power control, Current limiting reactors, Different types of bus system layouts, Forces on buses in the case of short circuits, Nuclear power stations, Comparison with conventional generation methods, Chain reactions, Moderators, Classification of reactors, Special power reactors, Shielding**.**

ELECTRICAL AND ELECTRONICS ENGINEERING
(POST RELATED)
Part- II
Marks: 50

1. **Electronics, Power Electronics**

Analog Electronics:
PN Junction Diode and Diode Circuits: Semiconductor Materials, Construction of PN Junction, Formation of Depletion Layer and Barrier Voltage in PN Junction, *I-V* Characteristics of a PN Junction Diode, Load Line, Half -Wave and Full-Wave Rectifier, Voltage Multiplier, Clipper and Clamper, Zener Diode Operation and Applications.
Bipolar Junction Transistors (BJT): Construction and Operation of BJT, Amplifying Action, Characteristics of BJT in CB and CE configurations, Current gain- α and β, Q-Point and Load Line, Different Biasing Circuits, Stability Factor, BJT as a Switch, r_e and Hybrid (*h*-Parameter) Equivalent Circuit of BJT.
Single Stage BJT Amplifier Circuits: Operation of Single-Stage Amplifier, Voltage and Current Gain, Input and Output Impedance of CB, CE, CC Configurations using *h*-Parameter.
Field Effect Transistor (FET): JFET Structure, Operation and Characteristics, *h*-Parameters for JFET, MOSFET Construction, Operation and Characteristics, Biasing Circuits of JFET and MOSFET, Single-stage JFET Amplifier, MOSFET as a Switch, CMOS Inverter.
Feedback Amplifiers: Principle of Feedback Amplifier, Positive and Negative Feedback, Advantages of Negative Feedback, Gain Stability.
Operational Amplifiers (Op-Amp):
Basic Construction of Op-Amp, Properties of Ideal Op-Amps, Frequency Response of Op-Amps, Inverting and Non-Inverting Amplifier, Summing and Difference Amplifier, Voltage Follower, Differentiator, Integrator, Op-Amp Comparator, Precision Rectifier, Active Filters- Different Types of Filters, Transfer Functions, Design and Construction of First and Second Order Low, High and Band Pass Filters using Op-Amps.
Oscillators: Basic Principle of Oscillator, Bark-Hausen Criterion, Phase Shift Oscillators, Wein Bridge Oscillator, Colpitts and Hartley, Crystal Oscillator, Negative Resistance Oscillator.
Power Amplifiers: Class A, Class B, Class AB Power Amplifier, Transformer-Coupled Class A Amplifier, Push-Pull Amplifier, Complementary Symmetry, Quasi-Complementary, Class-D Amplifier.
Pulse and Switching Circuits: Classification of Multivibrators (MV), Astable, Monostable MV using BJT, Schmitt Trigger with BJT, Voltage and Time Base Generators.
Voltage Regulators: Series and Shunt Regulations, Design of voltage regulators.
Phase Locked Loops (PLL): Basic PLL, Major Building Blocks, Lock and Capture Range, Applications of PLL, FM Demodulation, FSK Demodulation, AM Demodulation, Frequency Synthesizer.

Digital Electronics:
Logic Gates: Different types of logic gates, Universal Gates.
Boolean Algebra and Logic Simplification: Boolean Operations, De Morgan's Theorems, Boolean Analysis of Logic Circuits, Karnaugh Map, Don't Care Conditions.
Arithmetic Operations and Circuits: Half and Full Adders, Half and Full Subtractor, 2's complement, Ripple Carry and Look-Ahead Carry Adders, BCD Adders, Cascading BCD Adders,

Functions of Combinational Logic: Binary-to-Decimal Decoders, BCD-to-Decimal Decoder, BCD-to-7-Segment Decoder/Drivers, Decoder IC, Encoders and Applications.
Multiplexers: Two, Four, Eight, Sixteen input multiplexers, Quad Two-Input MUX, Multiplexer Applications.
Sequential Logic: NAND/NOR Gate Latch, Edge-Detector Circuit, Clocked S-C, J-K, D and T Flip-Flops, Master/Slave Flip-Flop, Clocked J-K Flip-Flop with Asynchronous Inputs, Flip Flop Applications: Switch Bouncing Reduction, Parallel Data Transfer, Serial Data Transfer.
Shift Registers and Counters: Types of Shift Register, Operatoin, Shift Register Counters: Ring Counter and Johnson Counter, Asynchronous Counters, Asynchronous Down Counters, Synchronous Up/Down Counters, Pre-settable Counters, Design of Synchronous Counters and Cascaded Counters.
Digital-to-Analog Conversion and Analog-to-Digital Conversion: Weighted Resistors, R-2R Ladder DAC, Methods of ADC: Flash, Digital Ramp, Successive Approximation Converter, ADC and DAC Applications.
Digital MOSFET Circuits: NMOS, PMOS and CMOS logic circuits.
Programmable Logic Device: Programmable Logic Device (PLD), Programmable Logic Array (PLA), Field-Programmable Gate Array
(FPGA).

Power Electronics:
Power Semiconductor Switches and Triggering Devices: BJT, MOSFET, SCR, IGBT, GTO, TRIAC, UJT and DIAC.
Rectifiers: Unicontrolled and Controlled Single Phase and Three Phase Rectifiers.
Regulated Power Suppliers: Linear-Series and Shunt, Buck, Boost, Buck-Boost and Cuk Regulators. AC Voltage Controllers, Single and Three-Phase, Choppers, DC Motor Control.
Inverters: Single Phase and Three Phase Current and Voltage Source, Resonance Inverters, Pulse Width Modulation Control of Static Converters.
AC Motor Control, Stepper Motor Control.

2. **Communication Engineering**

Overview of Communication Systems: Basic Principles, Fundamental Elements, System Limitations, Message Source, Bandwidth Requirements, Transmission Media Types, Bandwidth and Transmission Capacity.
Noise: Sources of Noise, Characteristics of Various Types of Noise and Signal to Noise Ratio.
Analog Communication Systems: Amplitude Modulation- Introduction, Double Side Band, Single Side Band, Vestigial Side Band, Quadrature, Spectral Analysis of Each Type, Envelope and Synchronous Detection, Angle Modulation-Instantaneous Frequency, Frequency Modulation (FM) and Phase Modulation (PM), Spectral Analysis, Demodulation of FM and PM, AM Transmitter and Receiver, FM Transmitters and Receivers, Noise Limiting Circuits, AGC Circuits, Sampling Theorem, Nyquist Criterion, Aliasing, Instantaneous and Natural Sampling, Flat-Topped Sampling, Pulse Amplitude Modulation-Principle, Bandwidth Requirements, Pulse Code Modulation (PCM)- Quantization Principle, Quantization Noise, Nonuniform Quantization, Signal to Quantization Noise Ratio, Differential PCM, Demodulation of PCM, Delta Modulation (DM)- Principle, Adaptive DM, Delta-Sigma Modulation, Adaptive DPCM (ADPCM), Line Coding- Formats and Bandwidths.

Digital Modulation and Demodulation: Amplitude-Shift Keying-Principle, ON-OFF Keying, Bandwidth Requirements, Detection, Noise Performance, Phase-Shift Keying (PSK)- Principle, Bandwidth Requirements, Detection, Differential PSK, Quadrature PSK,

Noise Performance, Frequency-Shift Keying (FSK)- Principle, Continuous and Discontinuous Phase FSK, Minimum-Shift Keying (MSK), GMSK, Bandwidth Requirements, Detection of FSK, Multilevel Signalling, M-Ary Modulation Techniques, Spread Spectrum Modulation Techniques, DSSS, FHSS.

Multiplexing: Time-Division Multiplexing (TDM), Receiver Synchronization, Frame Synchronization, TDM of Multiple Bit Rate Systems, Frequency-Division Multiplexing (FDM) Principle, Demultiplexing; Wavelength-Division Multiplexing, Multiple-Access Network- Time-Division Multiple-Access (TDMA), Frequency-Division Multiple Access (FDMA), Code-Division Multiple-Access (CDMA) Spread Spectrum Multiplexing, Coding Techniques and Constraints of CDMA.

3. **Microprocessor and Interfacing**

Introduction to Microprocessor: Classification and Evolution of Microprocessor, Difference between Microprocessor and Microcontroller.

8086 Microprocessor: Basic Architecture, Registers, Flags, Real Mode Operation of 8086 Microprocessor, Segment, Offset and Physical Address, Instruction Format, Functions of Different Instructions of 8086 Microprocessor, Pins and Signals, Bus Buffering and Latching, Bus Timing, Ready and Wait State Generation, Clock Generator (8284A), Memory Segmentation.

Interrupts: Introduction to Interrupts, Interrupt Vector Table, Interrupt Instructions and Operation, Hardware and Software Interrupts, Interrupt Driven I/O, Programmable Interrupt Controller (8259A).

Microprocessor Programming: Introduction to Assembly Language Programming (ALP), Macro and Procedure, Writing Simple ALPs using Different I/O Functions, Macro, Procedures.

Memory: Memory Types, Memory Banks, Memory Read-Write Cycle, Memory Interfacing.

I/O Interfacing: I/O Instructions, Basic I/O Interfacing, I/O Port Address Decoding, Programmable Peripheral Interface (8255A IC), Peripheral Interfacing Examples, Programmable Interval Timer (8254), Timer Interfacing, D/A and A/D Converter, Programmable Communication Interface, Interfacing Serial I/O Devices.

DMA: Basic DMA Operation, DMA Controller, DMA Processed Interface.

4. **Control Systems**

Introduction: Introduction to Control Systems, Definitions and classification

Solution of Differential Equations: Standard Inputs to Control Systems, SteadyState Response and Transient Response.

System Representation: Block Diagrams, Determination of the Overall Transfer Function, Signal Flow Graphs.

Control System Characteristics: Routh-Hurwitz Stability Criterion, Feedback System Types, Analysis of System, Types, Steady-Mate Error Coefficients, Non Unity-Feedback System.

Root Locus: Plotting Roots of a Characteristics Equation, Qualitative Analysis of the Root Locus, Open-Loop Transfer Function, Poles of the Control Ratio, Applications of the Magnitude and Angle Condition.

Root Locus Compensation Design: Introduction to Design, Transient Response Dominant Complex Poles, Additional Significant Poles, Ideal Integral Cascade Compensation (PI Controller), PID controller, Ideal Derivative Cascade Compensation (FD Controller), FID Controller, Introduction to Feedback Compensation.

COMPUTER SCIENCE

(POST RELATED)
Subject Code: 971
Total Marks-100

Part-I
Marks-50

(a) Computer Programming:
Introduction to computer programming. Assembling language programming. Problem solving techniques, algorithm specification and development. Programming style, testing and debugging. Program design techniques: Structured and modular program design. Programming languages and paradigms: classification. Programming in C: Data type, statements, control structures, arrays, pointers, strings, functions, preprocessor directives, structures, unions and bit-fields, files. Introduction to object oriented programming: Encapsulation, inheritance and polymorphism, Mechanic Language Programming, Template functions and classes multi-threads exceptions, Class and object. Introductory programming with C++/JAVA.

(b) Digital System:
Number system: binary, octal, hexadecimal and BCD. Data representation. Logic gates and Boolean algebra: Combinational circuits. Circuit design using logic gates. Circuit and expression minimization: Karnaugh map and Quine-McCluskey. Basic flip-flops (FF), Design of half and full adder. Basic counters and register. Basic decoders, encoders, multiplexers and demultiplexers. ADC and DAC circuits. PLA design, Pulse mode and fundamental mode logic, Pulse & switching units, Newtrivibrations , Digital LC: DTL, TTL, III, CMOS MOS gates, Memory system, LED, LCD applications of Op-Amps. Cooparators.

(c) Discrete Mathematics:
Prepositional and predicate calculus: Basic concept. Theory of sets: set operations, algebra of sets. Mathematical induction. Basic concept of relations and its representation. Functions and its classification and pictorial representation. Graph theory and its application. Elementray number system. Principles of counting. Reversion, generating, functions, recurrence relation.

(d) Numerical Analysis:
Solving linear systems with Gaussian elimination and Gauss-Jordan elimination method. Interpolation: Newton's formula, Lagrange's formula. Numerical differentiations and integrations: Trapezoidal, Simpson's $1/3^{rd}$ and $3/8^{th}$ rule. Romberg integration. Solutions and Newton-Ralphson's method. Solution of ordering differential equation and least square approximation of functions.

(e) Data Structures:
Arrays: Representation and operations. Sparse and dense matrices: Concept and operation. Stacks and queues: Concept, structures and basic operations. Quick-sort and Polish notation: Applications of stack. Recursion: Concept and applications. Linked lists: Representation and various operations. Trees: Binary trees, traversing binary trees. Binary search trees: Various opeations. Binary heaps: Heap sort. Huffman's algorithm. Graphs: Representations and operations. Spanning trees, shortest path and topological sorting. Internal sorting: Insertion sort, selection sort, merge-sort, radix sort, Basic hashing techniques.

(f) Microprocessor and Interfacing:
Microprocessor and microcomputers. Evolution of microprocessor. Architecture of a general purpose microprocessor and its operation. Addressing modes. Common instruction types: Basic assembly instruction set. Intel 8086 microprocessor: Internal architecture, register structure, programming model, addressing modes and instruction sets. Interrupts its classification and interrupt handling, Memory management in Intel 80_x86 family: Real-mode memory management, segmentation and segmented to physical address translation. Protected mode memory management: Segmentation and virtual addressing, segment selectors and descruptors and tables. Intel 80386 and 80486 register formats. Paged memory operation and TLB structure I/O port organization and accessing. Interfacing the keyboard, printer and monitor. Structure and operation of certain chips as 8255A, 8253, 8272, 8259A, 8237. Bus interfaces and micro controllers.

(g) Computer Organization and Architecture:
Fundamentals of computer design. Processor and ALU design. Control design: Hardware control and micro-programmed control. Caches Memory organization. Exceptions System organization Bus and hazards I/O subsystem and I/O processor. Parallel processing: Concept, pipeline processors. Interrupts systolic arrays and fault-tolerant computers.

(h) Compiler and theory of computation. Introduction to compiliary. Basic issues, logical analysis, hexical analysis, syntax analyses. Semantic analysis, type cheeking, run-time environments, code generation, code optimization and language theory.

COMPUTER SCIENCE

Part-II

Marks-50

(a) Algorithm:

Algorithm and complexity: Asymptotic notations. Basic algorithm techniques and analysis: Divide and conquer, dynamic programming, greedy method, branch and bound, string matching, computational geometric problems, graph algorithms, spanning trees, shortest paths, max-flow problem, searching algorithms. Techniques for analysis of algorithms, approximation algorithms, parallel algorithms.

(b) Operating System:

Introduction, evolution, goals and components of OS. Types of OS Process management: Process states PCB, job and process scheduling. CPU scheduling algorithms, critical section problems and solutions. Semaphores, Inter-process communication techniques. Deadlick handling methods. Memory management techniques: Paging, segmentation and page replacement policies. Secondary storage management: Disk scheduling algorithms. File management: File system structure, organization, FCB, space allocation, tree structured file system. Protection and security: classification and handling techniques.

(c) Database Management System:

Definition of DBMS, types of DBMS, its advantages and disadvantages, Data model: ER model and relational model. Integrity constraints. Functional dependencies. Assertions and triggers. File organization: Definition of various file organization, classification and Representation. Indexing techniques: sparse and dense indexing. B+ tree indexing, hash indexing. Relational database design: normalization, 2NF, 3NF and BCNF. Query processing: Various notations, cost estimation of selection operation and join operation. Transaction concept and concurrency control: Lock based protocol, deadlock handling. SQL and application using SQL.

(d) Software Engineering:

Introduction, Software process. Project management. Requirements engineering processes. System models: Context, data, behavioral and object models. Object oriented design techniques. Real-time software design. System design with reuse. Critical system design dependability, software maintenance, critical system specification and development Verification and validation. Software testing. Software cost estimation: COCOMO model Halstead formula, Graph: Cel analysis of complexity measures, software reliability and availability, Quality assurance.

(e) Data Communication:

Introduction to OSI and TCP/IP protocol. Data transmission basics: analog and digital data, spectrum and bandwidth. Transmission impairments. Data rate channel capacity. Transmission media: Twisted pair, coaxial cable and optical fiber, wireless transmission. Data encoding: NRZ. NRZI, Manchester and differential Manchester modulation techniques-AM, FM, PM, Della modulation, compounding Equations, ASK, PSK, FSK. QPSK. QAM sampling theorem, PCM. PPM. PAM. Data transmission: Synchronous and asynchronous and asynchronous. NUll modem configuration. Data link control error and flow control CRC and HDLC. Multiplexing: FDM, TDM, statistical TDM. Basic circuit switching and packet switching techniques.

(f) Computer Network and the Internet:

Protocol, fundamentals of control protocol,
Introduction and network types, LAN, MAN, WAN. Topologies: Star, switched, bus, ring. Ethernet LAN standards. Internetworking: Network interconnection, bridges, routers. Network layer protocols: IP, ARJP, ICMP, IP addresses. Unicast and multicast routing protocols. IPV6 congestion control, Transport layer protocol: TCP and UDP. Introduction to wireless LAN, VSAT, analog and digital cellular system. Network security: Types of attack, encryption techniques and digital signatures. ATM switches, ATM protocol; DNS, HTTP, Email.

(g) Artificial Intelligence:
Overview of AI. General concepts of knowledge. Introduction to PROLOG. Knowledge representation. Intelligent agents. First order logic. Knowledge organization and manipulation: Search strategies, matching techniques and game planning. Natural language processing, Probabilities reasoning, expert systems and computer vision, Knowledge acquisition: Learning in symbolic and non-symbolic representation.

STATISTICS

(POST RELATED)
Subject Code: 981
Total Marks-100

Part-I
Marks - 50

1. Introduction to Statistics: Definition and scope, Scope of Statistics, Classification, Variables.
2. Presentation of Data: Charts or Diagrams, Types of diagrams.
3. Grouping Data: Frequency Distribution, General rules for forming frequency, Graphical presentation of frequency distribution, Relative frequency distribution.
4. Measures of Central Tendency: The Arithmetic mean, the Median, The Mode, The Geometric Mean. The Harmonic Mean, Finding Measures of Central tendency from Grouped data, Graphical determination of Measures of Central tendency, Comparative discussion on measures of central tendency.
5. Measures of Dispersion: Dispersion or variation, Measures of dispersion from grouped data, Interpretation of Standard deviation, Chebyshev rule, Normal rule, Relative dispersion: Co-efficient of Variation.
6. Skewness and Kurtosis: Skewness, Kurtosis, Skewness and kurtosis from graphical displays, Descriptive measures of skewness and kurtosis.
7. Regression and correlation: Simple regression and correlation. Least squares estimates of simple linear regression, regression coefficient and correlation coefficient. Rank correlation, correlation ratio and partial correlation. Multiple regression and multiple correlation coefficient. Coefficient of determination.
8. Demography: Crude birth and death rates, Fertility rate, Age specific and total fertility rates, Population growth in Bangladesh, Migration, Nuptiality.
9. Index Number: Definition, Properties of index numbers, Significance of index numbers, Classification of index numbers, Simple Index Number, Un weighted indices, Simple average of price index, Simple Aggregate Index, Weighted Indices, Laspeyres index, Paasche method, Fisher's Ideal Index, Weighted average of relatives.
10. Time Series Analysis: Components of a time series. Measurement of secular trend, seasonal variations, cyclical variations and measurement of irregular variations.
11. Sampling: Statistical population and sample. Advantages and disadvantages of sampling over census. Sample design. Probability and non-probability sampling. Simple random sampling, stratified random sampling and systematic sampling. Cluster sampling, sampling error and non-sampling error. Determination of sample size.

STATISTICS

Part-II

Marks - 50

1. Concept of probability: Basic Definitions, Approaches of Defining probability, Basic properties of probabilities, Notation and Graphical displays for events.

2. Rules of Probability: Special Addition rule, The complementation Rule, General Addition rule, Bivariate data and Contingency table. Joint and marginal probabilities, Multiplication rules, Conditional probabilities, Concept of Bayes' Theorem.

3. Random Variables and probability Distributions : Random variable, Discrete Probability Distribution, Binomial Probability, Hypergeometric distribution, Poisson distribution, Normal distribution.

4. Sampling Distribution: Sampling distribution of the sample mean for a normally distributed variable, The Central Limit Theorem (CLT), Sampling Distribution of the Sample Mean, Sampling distribution of the sample proportion, Sampling distribution of function of mean and proportion. Confidence interval, Confidence interval of Population mean. Depermination of Sample size, Sampling for estimating mean, Sampling for estimating proportion.

5. Basic Concepts of Hypothesis Testing : Null and Alternative hypothesis, simple and composite hypotheses, Test statistic, acceptance and rejection regions, type I and type II errors, the significance level, one tailed and two tailed tests, general procedure for test of hypothesis. Tests based on normal, student's t, F, and X^2 distribution. The Z- test for two population means. The pooled t-test for two population means. The paired t-test for two population means.

6. Analysis of Variance : Concept of analysis of variance, treatment, response, extraneous variables, One-Way Anova Model, Estimate of The Model Parameters, Hypothesis Testing In Anova. Two-Way Anova, significance of Correlation and rank correlation coefficients. Multiple comparison test. Two-way analysis of variance with and without interaction.

7. Experimental Designs: Basic principles of Experimental Design. Randomization, Replication and Local control. The completely Randomized Design (CRD), Randomized Complete Block Design (RCBD) and Latin square Design.