KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY

B.Sc. Engineering 2nd Year 2nd Term Examination, 2017

Department of Electronics and Communication Engineering

ECE 2201

(Analog Communications)

TIME: 3 hours FULL MARKS: 210

N.B. i) Answer **ANY THREE** questions from each section in separate scripts.
ii) Figures in the right margin indicate full marks.

SECTION A

(Answer **ANY THREE** questions from this section in Script A)

1. a) What is the difference between information and message? Explain the effective communication system in terms of message and information. (04+03)
   b) What is modulation? Why is modulation necessary in communication system? (03+06)
   c) Explain the amplitude modulation mathematically. Draw the spectrum of the SSB-SC and DSB-SC waves. (08+04)
   d) Determine the percentage of the ratio of the sidebands power to the total output power of the AM wave for m=0.7 and m=0.4. (07)

2. a) Tabularize the comparisons between the tuned and superhetrodyne radio receivers. (06)
   b) What is VSB modulation? Explain the balanced modulator with necessary diagram and prove that the output of a balanced modulator is the product of modulating and carrier signals. (03+09)
   c) Explain the coherent detection process of DSB-SC modulated wave. (06)
   d) Explain the frequency and phase discrimination method for generating an SSB modulated wave. (11)

3. a) Explain the generation of FM from PM and vice versa. (12)
   b) What are the difference between the narrow band FM and full AM? Write down the expression of narrow band FM and PM. (06+06)
   c) An analog modulated signal with carrier frequency $\omega_c = 2\pi \times 10^6$ is described by the equation $\phi_{EM}(t) = 15\cos(\omega_c t + 0.10\sin 2500\pi t)$ (11)
      i. Find the power of the modulated signal
      ii. Find the frequency deviation, Δf
      iii. Find the deviation ratio, β
      iv. Estimate the bandwidth of $\phi_{EM}(t)$.

4. a) Prove that the tone-modulated FM signal has a carrier component and infinite number of sidebands of frequencies. (15)
   b) What are the requirements of commercial FM. Explain the principle of demodulation of FM signals. (10)
   c) Design an Armstrong indirect FM modulator to generate an FM carrier frequency of 96 MHz and $\Delta f = 20kHz$. A NBFM generator with $f_c = 200kHz$ and adjustable Δf in the range of 9 to 10 Hz is available. A local oscillator with adjustable frequency between 9MHz and 10 MHz is available for frequency mixing. There is a bandpass filter with any center frequency and only frequency doublers are available. (10)

SECTION B

(Answer **ANY THREE** questions from this section in Script B)

5. a) What are the sources of noise in communication system? Explain the impact of shot noise in analog communication. (05+05)

b) Show that the mean square output voltage of a noise source is independent of resistance and inversely proportional to capacitance. (11)

c) What is thermal noise is called "White noise"? (05)

d) The first stage of a two-stage amplifier has a voltage gain of 10, a 600Ω input resistor, a 1600Ω equivalent noise resistance and a 27kΩ output resistor. For the second stage, these values are 25, 81kΩ, 10kΩ and 1MΩ, respectively. Calculate the noise figure of the amplifier if it is driven by a generator whose output impedance is 50Ω. (09)

6. a) Show that the output SNR for a DSB-SC system can be expressed as $\frac{S_0}{N_0} = \frac{S_i}{\eta f_m}$, (09)

Where S_i = input signal power, η= white noise PSD, and f_m=baseband bandwidth.

b) How is the limiter used to suppress amplitude variation noise in FM system? (06)

c) For the operations performed by discriminator and baseband filter on the noise output of the limiter shown in Fig. 6(c), derive the expression for the output noise power for the FM demodulation system. (10)

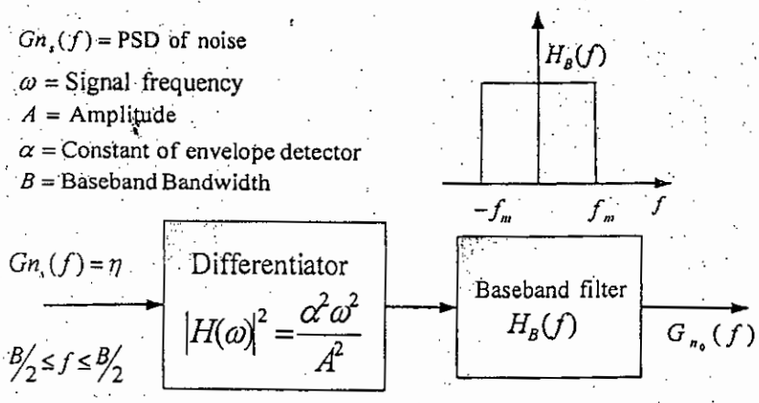

Fig. 6(c)

d) A receiver SSB signal of strength 1mW has a power spectrum which extends over the frequency range $f_c = 1MHz$ to $(f_c + f_m) = 1.005MHz$. The accompanied noise has uniform power spectral density $10^{-9}W/Hz$. This is multiplied by a local oscillator of frequency 1MHz and then followed by a baseband filter of cut-off frequency f_{MC} to get message signal. What is the message bandwidth? Find the signal and noise energy at the output of baseband filter and calculate the SNR. (10)

7. a) Why multiplexing is important in communication system? Explain the TDM technique with its advantages and disadvantages. (03+08)

b) Explain the requirements of filters in FDM. (04)

c) Six independent message sources of bandwidth A, A, 2A, 2A,3A and 3A Hz are to be transmitted on a TDM basis using a common communication channel; (i) setup a scheme for accomplishing this multiplexing requirement, with each message signal sampled at its Nyquist rate. (ii) determine the minimum transmission bandwidth of the channel. (10)

d) Design an FDM system for telephone based voice communication which are considering the following requirements: Number of users = 16; FDM output signal bandwidth=54kHz; Modulation technique=AM(DSB-SC); should have "guard band". (10)

8. a) What is composite video signal? Explain the composite video signal with necessary diagrams (03+05)

b) Describe the basic principle of color television transmission and reception. (09)

c) What is compatibility? Draw the TV transmission signal spectrum within the 6 MHz channel assignment. (03+05)

d) In the U.S. NTSC system, the aspect ratio is 4/3, the total number of line periods per frame is 525, and the number of suppressed lines are 40 per frame. Find the picture height and width in the number of pixels. Also, find the number of pixel periods in a line period. (10)

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY

B.Sc. Engineering 2nd Year 2nd Term Examination, 2017

Department of Electronics and Communication Engineering

ECE 2205

(Electromagnetic Fields and Waves)

TIME: 3 hours FULL MARKS: 210

N.B. i) Answer **ANY THREE** questions from each section in separate scripts.
ii) Figures in the right margin indicate full marks.

SECTION A

(Answer **ANY THREE** questions from this section in Script A)

1. a) Write down the differential and integral form of fundamental postulates of electrostatics in free space and also state their physical significance. (08)
   b) Two equal charges, q of opposite sign, separated by a distance 'l' constitute an electric dipole. Derive an expression for the electric dipole (V) at P point in space due to this dipole, assume that the point is not too close to the dipole. (12)
   c) Define electric potential. Show that in an electric filed, work done in moving a unit charge from one point to another is equal to the electric potential difference between that two points. (08)
   d) A positive point charge of magnitude $4\mu C$ is situated in air at the origin of a rectangular co-ordinate system. Calculate the electric field strength at a point on the z-axis 8 meters from the origin. (07)

2. a) Define Homogeneous, Linear and Isotropic media. (06)
   b) Two dielectric media with permittivity ε_1 and ε_2 are separated by a charge-free boundary as shown in Fig. 2(b). The electric field intensity in medium 1 at the point P_1 has a magnitude E_1 and makes an angle α_1 with the normal. Determine the magnitude and direction of the electric filed intensity at point P_2 in medium 2. (08)

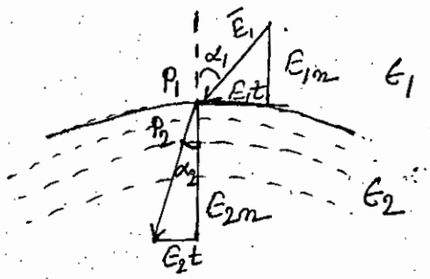

fig. 2(b)

   c) Derive the Poisson's equations with respect to an electric potential. What will be the solution of it? (08)
   d) A cylindrical capacitor consists of an inner conductor of radius 'a' and outer conductor whose inner radius is 'b'. The space between the conductors is filled with a dielectric of permittivity ε and the length of the capacitor is l, determine the capacitance of this capacitor. (13)

3. a) Define displacement current. Determine the displacement current in between two parallel plates of a capacitor energized by an alternating current source. (09)
   b) Write down the differential form and integral form of the Maxwell's equations and identify each equation with proper experimental law. (08)
   c) Deduce the homogeneous wave equations for both scalar and vector potentials. (10)
   d) A sinusoidal electric intensity of amplitude 250 (V/m) and frequency 1(GHz) exists in a lossy dielectric medium that has relative permittivity of 2.5 and a loss tangent of 0.001. Find the average power dissipated in the medium per cubic meter. (08)

4. a) Deduce the fundamental equation for free-space propagation. (11)
   b) What are the different types of propagation of radio wave from the radiating antenna to the receiving antenna? Explain with their practical examples. (12)
   c) *A VHF communication is to be established with 35W transmitter at 90 MHz. Find the distance up to which line of sight communication may be possible if the height of the transmitting and receiving antennas are 40m and 25m respectively. Also, determine the field strength at the receiving end.* (12)

SECTION B

(Answer **ANY THREE** questions from this section in Script B)

5. a) State and explain Ampere's circuital law. Suppose an infinity long straight conductor with a circular cross-section of radius b carries a steady current I. Determine the magnetic flux density both inside and outside the conductor. (11)

   b) State and explain Bio-Savart law. With the help of this law, find the magnetic flux density at the center of a square loop with side w carrying a direct current I as shown in Fig. 5(b). (12)

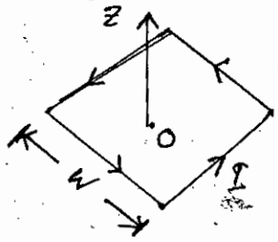

Fig. 5(b)

   c) Find the magnetic flux density at a distant point of a small circular loop of radius b that carries current I in terms of dipole moment. (12)

6. a) Define magnetic dipole. How do you calculate magnetic dipole moment? (06)

   b) What are the dissimilarities between electric dipole and magnetic dipole. (07)

   c) "A magnetized body may be replaced by an equivalent magnetization surface charge density and an equivalent magnetization volume charge density"-Justify the statement. (10)

   d) Consider a plane boundary (y=0) between air (region 1, μ_{r1}=1) and iron (region 2, μ_{r2}=5000). (i) Assuming $\vec{B}_1 = \hat{a}_x.0.5 - \hat{a}_y 10(mT)$. Find $\vec{B}_2$ and the angle that $\vec{B}_2$ makes with the interface. (ii) Assuming $\vec{B}_2 = \hat{a}_x 10 + \hat{a}_y 0.5(mT)$, find $\vec{B}_1$ and the angle that $\vec{B}_1$ makes with the normal to the interface. (12)

7. a) Determine the force per unit length between two infinity long parallel conducting wires carrying currents I_1 and I_2 in the same direction as shown in Fig. 7(a). the wires are separated by a distance d. (08)

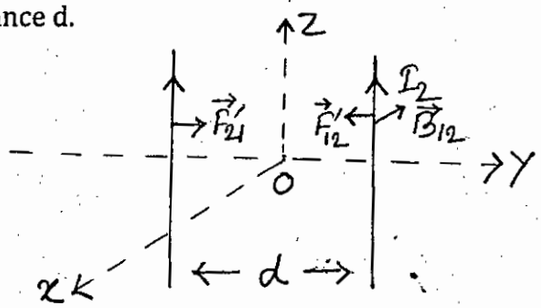

Fig. 7(a)

   b) What is meant by polarization of a wave prove that a linearly polarized plane wave can be resolved into a right hand circularly polarized wave and a left hand circularly polarized wave of equal amplitude. (08)

   c) Explain low loss dielectrics and good conductors with your knowledge of electromagnetics. (12)

   d) Explain the Doppler effect in electromagnetics with proper illustration. (07)

8. a) A narrow band signal propagates in lossy dielectric medium which has a loss tangent 0.2 at 550 Hz, the carrier frequency of the signal. The dielectric constant of the medium is 2.5, (i) determine α and β (ii) determine U_p and U_g. Is the medium dispersive? (12)

   b) Find the Poynting vector on the surface of a long straight conducting wire (of radius b and conductivity σ) that carries a direct current I as shown in Fig. 8(b). Also verify Poynting's theorem. (08)

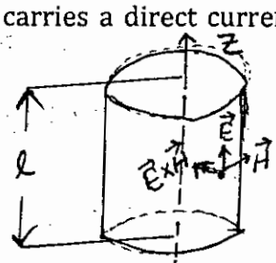

Fig. 8(b)

   c) If a EM wave follows normal incidence at a plan dielectric boundary, show that the reflection coefficient Γ and transmission coefficient, τ are related by $1+\Gamma=\tau$. (15)

KHULNA UNIVERSITY OF ENGINEERING &TECHNOLOGY

B.Sc. Engineering 2nd Year 2ndTerm Examination, 2017

Department of Electronics and Communication Engineering

CSE 2209

(Data Structures and Algorithms)

TIME: 3 hours FULL MARKS: 210

N.B. i) Answer **ANY THREE** questions from each section in separate scripts.
ii) Figures in the right margin indicate full marks.

SECTION A

(Answer **ANY THREE** questions from this section in Script A)

1. a) Define data structure. "Array and linked list are linear data structure"-Justify the statement. (07)
   b) Apply selection sort algorithm on the following data showing all steps: (10)
   56, 64, 2, 33, 97, 8.
   c) Briefly discuss the problems of array operations. (06)
   d) Let's your machine allocates 48bits for each floating-point number. An array declared to store 3 CT's mark of 60 students according to C++, first student, first CT's mark address is 1509001. Find the address of 20^{th}, 36^{th}, 9^{th} and 54^{th} students 1^{st}, 2^{nd}, 1^{st} and 3^{rd} CT's mark respectively. (12)

2. a) What is hashing? Explain the division method of hash function with example. (07)
   b) Writhe down the advantages and disadvantages of separate chaining. (08)
   c) Determine the hash table and calculate the average no. of probes for a successful search and an unsuccessful search using linear probing from the following information. (12)
   Table size-11, Keys=20,30,2,13,25, 24,10,9. H(key)=Key%11.
   d) What do you mean by primary clustering? How can it be solved? (08)

3. a) Define garbage collection. How does operating system manage it? (08)
   b) Write down the comparison between one way and two-way linked list. (05)
   c) Show that the complexity of bubble sort algorithm is $O(n^2)$. (07)
   d) Consider the following memory which used to store linked list. Here START=5 and AVAIL=7 (15)

Address	1	2	3	4	5	6	7	8	9	10	11	12
Value	ECE	CSE		EEE	CE	TE		LE		MSE	IEM	
Link	2	6	12	0	8	11	9	1	3	4	10	0

   i. Traverse the linked list.
   ii. Delete LE and show the memory updates.
   iii. Insert BECM at first and then show the memory updates.

4. a) Which search technique is better? Linear search or binary search? Why? (05)
   b) Write down the advantages and disadvantages of selection sort. (06)
   c) Discuss the complexity of insertion sort algorithm in "Best Case", "Average Case" and "Worst Case" situations. (12)
   d) Let's DATA be an array of total 13 sorted elements (12)
   DATA: 10, 20, 29, 38, 33, 43, 46, 53, 59, 68, 77,85,91,99.
   Apply the Binary search to DATA and show the steps for searching the ITEM=43.

SECTION B

(Answer **ANY THREE** questions from this section in Script B)

5. a) Differentiate between stack and queue. Give some real-life examples of stack and queue and explain them. (05)

b) Consider the following arithmetic expression P (15)

$$P: (8+4) * 3 \uparrow 2 - (7-3)/(4-2)$$

Using stack,

i. Translate P into its equivalent postfix expression.
ii. Evaluate the postfix expression.

c) Define priority queue. How do you write priority queue in a linear array and one-way list? (09)

d) Consider the following circular queue having 5 memory cells. (06)

			D	E
1	2	3	4	5

Front=4, Rear=5

6. a) "Creation of Binary search tree depends on the order of data".- Justify the statement. (08)

b) The in-order traversal and post order traversal of a binary tree T are given below: (13)

In-order	12	11	10	30	5	20	60	7
Post -order	11	30	10	12	20	60	7	5

Draw the tree and perform pre-order traversal on that tree.

c) Draw the binary search tree from the following data: (14)

$$50, 40, 90, 45, 30, 60, 70, 65, 95$$

Then delete 50 from that tree. Show each step.

7. a) "Quicksort is an application of stack"- Justify the statement with example. (06)

b) What is heap? Construct a Max heap step by step using the following data and then delete the root (15)

DATA: 10, 5, 8, 12, 15, 25, 35, 98, 80, 10.

c) Consider the graph $\mathbb{G}$ given in Figure 7(c). Find all pair shortest path using Wareshalls algorithm. (14)

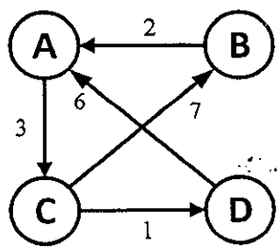

Fig.7(c)

8. a) Define complete graph and connected graph with proper examples. (05)

b) Consider the following graph $\mathbb{G}$ as show in **Figure 8(b)**. (i) Draw the adjacency matrix of $\mathbb{G}$. (ii) Draw the linked list representation of $\mathbb{G}$. (07)

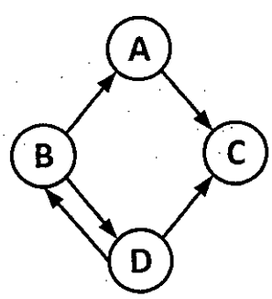

Fig. 8(b)

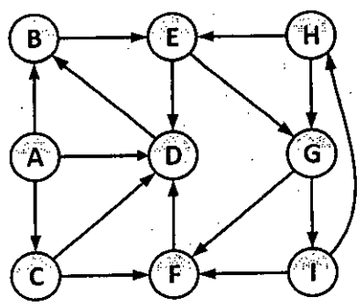

Fig. 8(c)

c) Apply Breath-first search (BFS) on the graph as shown in **Figure 8(c)**. Show all steps and start from node A. (13)

d) What is topology sort? Apply topological sort on the graph given in question 8(c). (10)

KHULNA UNIVERSITY OF ENGINEERING &TECHNOLOGY

B.Sc. Engineering 2nd Year 2nd Term Examination, 2017

Department of Electronics and Communication Engineering

EEE 2209

(Electrical Drives & Instrumentations)

TIME: 3 hours FULL MARKS: 210

N.B. i) Answer **ANY THREE** questions from each section in separate scripts.
ii) Figures in the right margin indicate full marks.

SECTION A

(Answer **ANY THREE** questions from this section in Script A)

1. a) Define electrical drive. Mention the basic differences between DC generator and DC motor. (06)

   b) Explain the voltage build up process in a generator. Why does a generator fail to build up? How the failure can be overcome? (14)

   c) What is armature reaction? Mention its effects and remedy in brief. (07)

   d) A long shunt compound generator delivers a load current of 50A at 500V and has armature, series field and shunt field resistances of 0.05Ω, 0.03Ω and 250Ω respectively. Calculate the generated voltage and armature current. Allow 1V per brush for contact drop. (08)

2. a) What are the different types of losses that occur in an electrical machine? Mention with their expressions. (08)

   b) Why starter is needed for motor? Mention the limitation of 3-point starter over 4-ponit starter. (07)

   c) What are the conditions of parallel operation of DC generator? Write the advantages and disadvantages of three and single-phase supply. (08)

   d) Sketch and explain the following motor characteristics for DC series motor: (i)Ta/Ia; (ii) N/Ia. A 220V -DC shunt motor runs at 500 rpm when the armature current is 50A and resistance is 0.2Ω. If the torque is doubled calculate the speed. (12)

3. a) Why the rating of a transformer is in KVA? How the parameters can be determined from open circuit and short circuit test of a single-phase transformer? Explain in brief. (12)

   b) Why does rotor is rotated of an induction motor? (08)

   c) Show that – "the magnitude of resultant flux of an induction motor is constant which rotates at synchronous speed". (08)

   d) A $3-\phi$ IM with star-connected rotor has an induced emf of 120V between slip rings at standstill with normal voltage applied to the stator. The rotor winding has a resistance per phase of 0.3Ω and standstill leakage reactance per phase pf 1.5Ω. Calculate - (i) rotor current/phase with 4% slip; (ii) slip and rotor current when rotor is developing maximum torque. (07)

4. a) What is synchronization of alternator? How it can be achieved? Draw the complete torque-speed curve of a three-phase machine. (07)

   b) Define universal motor. Why this is called so? Mention some of the applications. (09)

   c) Differentiate between induction motor and synchronous motor. Also draw their characteristics curve. (09)

   d) A single-phase transformer has 500 turns in the primary and 1200 turns in the secondary. The cross-sectional area of the core is 80 sq.cm. If the primary winding is connected to a 50Hz supply at 500V, calculate (i) peak flux-density and (ii) voltage induced in the secondary. (10)

SECTION B

(Answer **ANY THREE** questions from this section in Script B)

5. a) What is measurement and instrumentation? Write the basic requirements and significance of measurement systems. (06)

   b) Write down the properties of different types of instruments. Also draw the block diagram of generalized input-output configuration of a measurement system. (14)

   c) Define: (i) Static characteristics; (ii) Dynamic characteristics; (iii) Accuracy & Precision; (iv) Dead zone & Dead time; and (v) Static error. (10)

   d) Draw the pictorial diagram of CRO. (05)

6. a) Classify and discuss the different types of error arises in measurement system. What do you mean by loading effect explain briefly? (09)

   b) Define Piezo-electric effect. Mention the difference between sensor and transducer. (09)

   c) What is resistive transducer? Show that for the strain gauge the Gauge factor is $G_f = 1 + 2V$. (09)

   d) A strain gauge is bonded to a beam 0.1m long and has a cross-sectional area $4cm^2$. Young modulus for steel is 207 $^{GN}/_{m^2}$. The stain gauge has an unstrained resistance of 240Ω and a gauge factor of 2.2. when a load is applied, the resistance of gauge changes by 0.013Ω. Calculate the change in length of the steel beam and the amount of force applied to the beam. (08)

7. a) When a resistance thermometer? Write down the basic requirements of a conductor to be used in RTDs. (05)

   b) What is Seebeck effect? Write down the schematic diagram of thermocouple and thermistor with their characteristics curve. (08)

   c) Explain different types of photoelectric transducer with proper schematic diagram. Also write their advantages and disadvantages. (15)

   d) What is L.V.D.T? Explain its operating principle. Also write down its applications in measurement systems. (09)

8. a) For the following lissajous pattern as shown in Fig 8(a), determine unknown frequency if known frequency is 60Hz. (08)

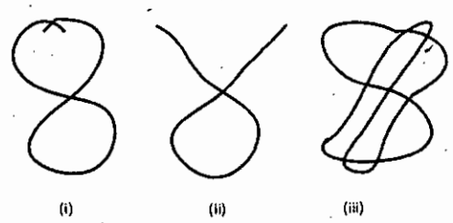

Fig. 8(a)

   b) Classify VTVM. Write short noted on average reading diode VTVM with their advantages and limitations. (10)

   c) Write down the block diagram of PC-based data acquisition system and explain the functions of each block. (08)

   d) What is chopper device? Derive the output equation of differential and logarithmic amplifier by using op-amp circuit. (09)

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY

B.Sc. Engineering 2nd Year 2nd Term Examination, 2017

Department of Electronics and Communication Engineering

Math 2209

(Mathematics IV)

TIME: 3 hours FULL MARKS: 210

N.B. i) Answer **ANY THREE** questions from each section in separate scripts.
ii) Figures in the right margin indicate full marks.
iii) Normal distribution tables will be supplied if necessary.

SECTION A

(Answer **ANY THREE** questions from this section in Script A)

1. a) Find all the values of $\left(\frac{1+i\sqrt{3}}{2}\right)^{3/4}$ and locate them graphically. (07)

b) Is $u(x,y)=y^2-x^2-2e^{-x}\sin y$ harmonic? If so, find its harmonic conjugate and the corresponding analytic function $f(z)$. (13)

c) If $f(z)=\frac{iz}{2}$, then by use of definition show that $\lim_{z\to i} f(z)=-\frac{1}{2}$. Is $f(z)$ continuous at $z=i$? Explain. (06)

d) Express $|z-2i|+|z+2i|<10$ in rectangular form and represent the region graphically. (09)

2. a) Locate and name the singularities in the finite Z-plane of the following functions: (09)

(i) $f(z)=(z^2+1)^{1/3}$, (ii) $f(z)=\frac{\ln(z-2)}{(z^2+2z+2)^3}$, (iii) $f(z)=\frac{\cot \pi z}{(z-1)^2}$

b) Find the Laurent's series expansion of $\frac{z+7}{z^2-z-6}$ in the region $2<|z|<3$. Give the statement of Taylor's theorem. (11)

c) State Cauchy's residue theorem, Evaluate $\frac{1}{2\pi i}\int_C \frac{e^{zt}}{z^2(z^2+2z+2)}dz (t>0)$ around the rectangle C with vertices at $z=1+\frac{3}{2}i$, $-2+\frac{3}{2}i$, $-2-\frac{i}{2}$ and $1-\frac{i}{2}$ drawn in the positive sense. (15)

3. a) Evaluate $\int_C (z-2\bar{z})dz$ along the curve C where (i) C is the straight line from $z=1+i$ to $z=3+i$ and then from $z=3+i$ to $z=3+3i$, (ii) C is the straight line directly from $z=1+i$ to $z=3+3i$. (12)

b) Evaluate $\int_0^{2\pi} \frac{d\theta}{(5-3\sin\theta)^2}$ by contour integration. (18)

c) If $\alpha-i\beta=\frac{1}{a+ib}$, then show that $(\alpha^2+\beta^2)(a^2+b^2)=1$. (05)

4. a) Express $4x^3+6x^2+7x+2$ in terms of Legendre Polynomials. (10)

b) Show that $P_n(-x)=(-1)^n P_n(x)$. (05)

c) A string is stretched tightly between x=0 and x=l and both ends are given by displacement $y=a\ sinpt$ perpendicular to the string. If the string satisfies the wave equation $\frac{\partial^2 y}{\partial x^2}=\frac{1}{C^2}\frac{\partial^2 y}{\partial t^2}$, show that the oscillations of the string are given by $y=a\sec\frac{pl}{2c}\cos\left(\frac{px}{c}-\frac{pl}{2c}\right)\sin pt$. (20)

SECTION B

(Answer **ANY THREE** questions from this section in Script B)

5. a) Solve in series the equation $x(1-x)\frac{d^2y}{dx^2}-(1+3x)\frac{dy}{dx}-y=0$ (20)

b) Prove the recurrence formula $j_n(x)=\frac{x}{2n}[j_{n-1}(x)+j_{n+1}(x)]$ (08)

c) Using generating function show that $\cos(x\sin\theta)=j_0+2[j_2\cos 2\theta+j_4\cos 4\theta+.....]$. (07)

6. a) Discuss the different types of frequency curves. (10)

b) A frequency distribution of the weekly wages of 65 employees at the Asian Paint company are given in the following table: (15)

Wages	No. of employees
Tk. 250.00-Tk. 259.99	8
Tk. 260.00-Tk. 269.99	10
Tk. 270.00-Tk. 279.99	16
Tk. 280.00-Tk. 289.99	14
Tk. 290.00-Tk. 299.99	10
Tk. 300.00-Tk. 309.99	5
Tk. 310.00-Tk. 319.99	2

Determine:

(i) The lower limit of the sixth class

(ii) The upper limit of the fourth class.

(iii) The class mark of the third class

(iv) The frequency of the third class

(v) The percentage of employees earning less than Tk. 280.00 per week.

c) Calculate the mean and standard deviation for the following table giving the age distribution of 542 members: (10)

Age in years:	20-30	30-40	40-50	50-60	60-70	70-80	80-90
No. of members:	3	61	132	153	140	51	2

7. a) Define the following with examples: (10)

(i) Impossible event (ii) Certain event (iii) Independent event (iv) Mutually exclusive event and v) Random variable.

b) A factory manufacturing televisions has four units A, B, C and D. The units A, B, C, and D manufacture 15%, 20%, 30% and 35% of the total output respectively. If was found that output of their televisions 1%, 2%, 2%, and 3%, are defective. A television is chosen at random from the total output and found to be defective. What is the probability that it come from unit C? (10)

c) Test whether the distribution is a probability distribution: (02)

x	0	2	4	6
P(x)	-1.0	1.5	0.3	0.2

d) Let the continuous random variable X denote the current measured in a thin copper wire in milli-amperes. Assume that the range of X is [0, 20mA], and assume that the probability density function of X is f(x)=0.05 for $0 \le x \le 20$. Determine: (13)

(i) The probability that a current measurement is less than 10 milli-amperes.

(ii) The expected value of X. (iii) The variance of X.

8. a) If a variable in binomially distributed, determine its mean μ and variance σ^2. Give some application of binomial distribution. (09)

b) A survey found that one out of five Bengalis say he/she has visited a doctor in any given month. If 10 people are selected at random, find the probability that exactly 3 will have visited a doctor last month. (06)

c) What are the conditions that the Binomial distribution tends to Poisson distribution? Suppose that a book of 600 pages contains 40 printing mistakes. Assume that these errors are randomly distributed throughout the book and the number of errors per page has a Poisson distribution. What is the probability that 10 pages selected at random will be free of errors? (10)

d) If the heights of 300 students are normally distributed with mean 68.0 inch and standard deviation 3.0 inch, how many students have heights greater than 72 inch. (10)