SDFG–U–ELX

ELECTRONICS AND TELECOMMUNICATION ENGINEERING

PAPER—I

Time Allowed : Three Hours | Maximum Marks : 300

QUESTION PAPER SPECIFIC INSTRUCTIONS

Please read each of the following instructions carefully before attempting questions

There are **EIGHT** questions divided in **TWO** Sections.

Candidate has to attempt **FIVE** questions in all.

Question Nos. **1** and **5** are compulsory and out of the remaining, **THREE** are to be attempted choosing at least **ONE** question from each Section.

The number of marks carried by a question/part is indicated against it.

Wherever any assumptions are made for answering a question, they must be clearly indicated.

Diagrams/Figures, wherever required, shall be drawn in the space provided for answering the question itself.

Unless otherwise mentioned, symbols and notations carry their usual standard meanings.

Attempts of questions shall be counted in sequential order. Unless struck off, attempt of a question shall be counted even if attempted partly.

Any page or portion of the page left blank in the Question-cum-Answer Booklet must be clearly struck off.

Answers must be written in **ENGLISH** only.

Values of constants which may be required :

Electron charge	$= -1{\cdot}6\times10^{-19}$ coulomb
Free space permeability	$= 4\pi\times10^{-7}$ henry/m
Free space permittivity	$= \left(\frac{1}{36\pi}\right)\times10^{-9}$ farad/m
Velocity of light in free space	$= 3\times10^{8}$ m/s
Boltzmann constant	$= 1{\cdot}38\times10^{-23}$ J/K
Planck's constant	$= 6{\cdot}626\times10^{-34}$ J-s

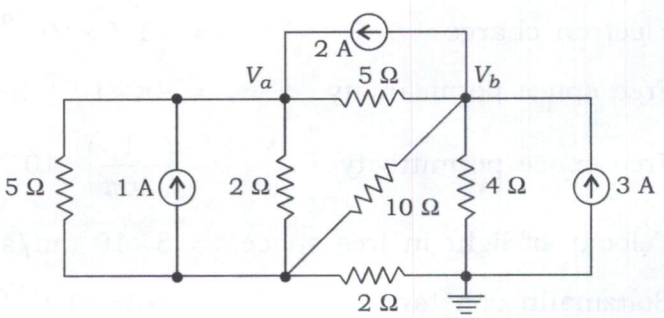
SECTION—A

1. *(a)* *(i)* An InGaAs photodiode operating at 1·3 μm is limited by background radiation giving $I_B = 10^{-7}$ A. The responsivity of the diode is 0·74 A/W at 1·3 μm. Find the minimum detectable power of this photodiode if the bandwidth of the device is 10 MHz and load resistance is $R_L = 10^7\ \Omega$. 6

(ii) An nMOS transistor has a threshold voltage (V_t) of 0·4 V and a supply voltage $V_{DD} = 1 \cdot 2$ V. A circuit designer is evaluating a proposal to reduce V_t by 100 mV to obtain faster transistor. By what factor would the subthreshold leakage current increase at room temperature at $V_{gs} = 0$? Assume $n = 1 \cdot 4$. 6

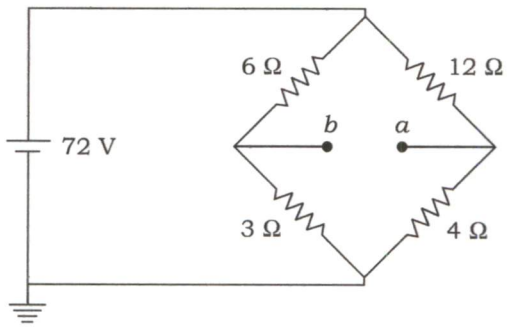
(b) Design a two-sided limiting circuit using a resistor, two diodes and two power supplies to feed a 1 kΩ load with nominal limiting levels of ± 3 V. Use voltage drop of 0·7 V for each diode when conducting. In the non-limiting region, the circuit voltage gain should be at least 0·95 V/V. 12

(c) Find the node voltages V_a and V_b for the circuit shown in the figure using node voltage analysis. Also, find the current through 5 Ω resistor :



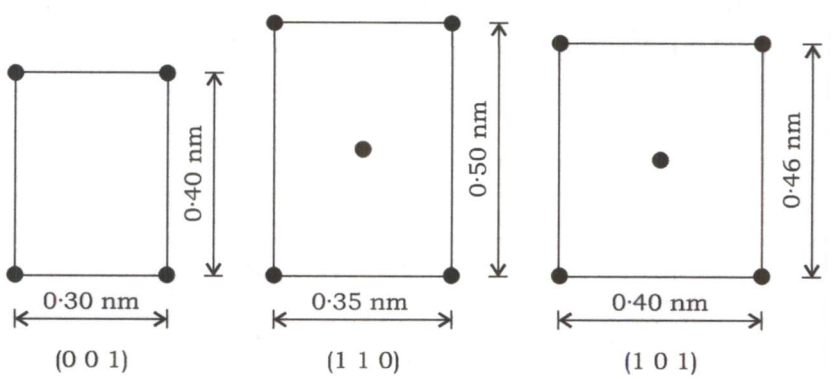
12

(d) Find the Thevenin equivalent circuit for the network shown below. Also, find the current through the load resistor of 10 ohms, if connected across the terminal *a–b* of the Thevenin equivalent circuit :



12

(e) The following figure shows three different crystallographic planes for a unit cell of a hypothetical material. For each plane, the circles represent only those atoms contained within the unit cell, where circles are reduced from their actual diameter/size. Identify the unit cell and the crystal system it belongs to :

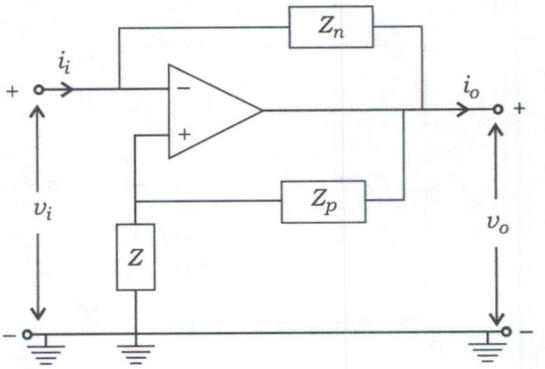


12

2. (a) (i) Why are boron and phosphorus almost universally employed for *p*-type and *n*-type impurities in silicon? 10

(ii) The diffusion coefficients for copper in aluminium at 500 °C and 600 °C are $4 \cdot 8 \times 10^{-14}$ m^2/s and $5 \cdot 3 \times 10^{-13}$ m^2/s, respectively. Determine the approximate time at 500 °C that will produce the same diffusion result as a 10-hour heat treatment at 600 °C. 5

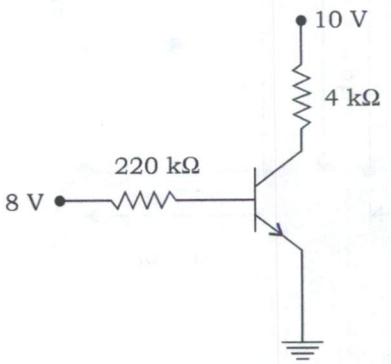
(iii) Find the driving-point impedance to the right of the input terminals of the given circuit. Comment on the result :



5

(b) (i) Derive the Fermi level position in an intrinsic semiconductor in terms of E_c, E_v and effective masses of electron (m_n^*) and hole (m_p^*). Hence, calculate the position of the intrinsic Fermi level with respect to the centre of the band gap in silicon at $T = 300$ K. Given that $m_n^* = 1 \cdot 08 m_0$ and $m_p^* = 0 \cdot 56 m_0$. Here, m_0 is rest mass of the electron. 10

(ii) Calculate the currents and voltages in the circuit given below. Also, calculate the power dissipated in the transistor. The transistor parameters are $\beta = 100$, $V_{BE(ON)} = 0 \cdot 7$ V, $V_{CE(sat)} = 0 \cdot 2$ V :



10

(c) (i) Predict the crystal structure and compute the theoretical density for FeO. Given—

Ionic radius of $Fe^{++} = 0 \cdot 077$ nm

Ionic radius of $O^{--} = 0 \cdot 140$ nm

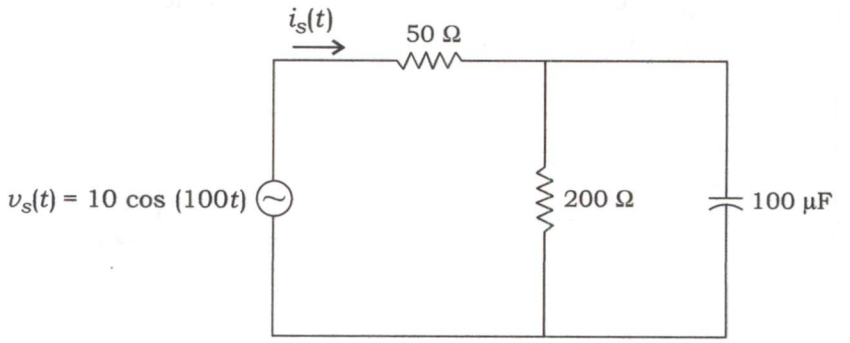
Atomic weight of Fe $= 55 \cdot 845$ g/mole

Atomic weight of O $= 16$ g/mole

Avogadro's number $= 6 \cdot 022 \times 10^{23}$/mole 10

(ii) How are ceramic products fabricated? Explain the role of powder pressing and sintering in the fabrication of ceramic products. 10

3. (a) (i) Determine the source current $i_s(t)$ for the circuit shown in the figure using phasor analysis method :



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(ii) A customer's plant has two parallel loads connected to the power utility's distribution lines. The first load consists of 50 kW of heating and is resistive. The second load is a set of motors that operate at 0·86 lagging power factor. The motors' load is 100 kVA. Power is supplied to the plant at 10000 volts r.m.s. Determine the total current flowing from the utility's lines into the plant and the plant's overall power factor. 10

(b) (i) Draw the power flow diagrams of a DC generator and a DC motor. 10

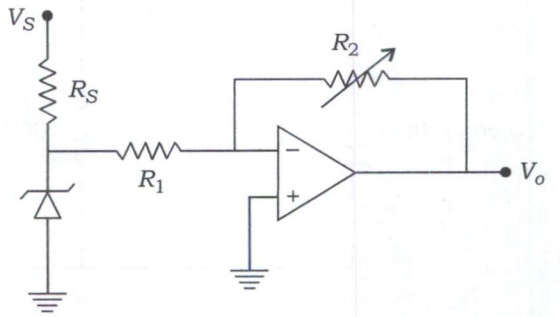
(ii) A 250 V shunt motor on no load runs at 1000 r.p.m. and takes 5 A. The total armature and shunt field resistances are respectively $0 \cdot 2\,\Omega$ and $250\,\Omega$. Calculate the speed when loaded and taking a current of 50 A, if the armature reaction weakens the field by 3%. 10

(c) (i) Derive an expression for electrical conductivity of an intrinsic semiconductor and compute the room temperature intrinsic carrier concentration for gallium arsenide. [Given, the room temperature electrical conductivity for gallium arsenide is $3 \times 10^{-7}\ (\Omega\,\text{m})^{-1}$. The electron and hole mobilities are $0 \cdot 80\ \text{m}^2/\text{V-s}$ and $0 \cdot 04\ \text{m}^2/\text{V-s}$, respectively] 10

(ii) Discuss Matthiessen's rule and explain the influence of the factors affecting resistivity of metals. 10

4. *(a)* *(i)* The recombination process in an LED at 300 K is dominated by bulk radiative, SRH and auger processes. The mean lifetimes of carriers due to radiative, SRH and auger processes are 5 ns, 10 ns and 25 ns, respectively. Estimate the quantum efficiency of the LED in absence of surface recombination. What is the bandwidth of this LED? 10

(ii) Find the maximum allowed voltage of V_S in the given adjustable output voltage regulator circuit. The Zener diode specifications limit the maximum current through Zener diode to $I_{Z_{max}}$:



10

(b) *(i)* State the applications of synchronous motors. Compare synchronous motor with induction motor. 10

(ii) Compare with neat sketches squirrel-cage and slip-ring three-phase induction motor with reference to construction, performance and applications. 10

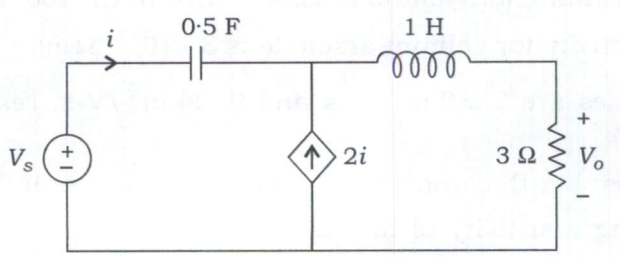
(c) *(i)* What is magnetic anisotropy? Explain the importance of magnetic anisotropy in transformer cores. 10

(ii) What are the different synthesis strategies for producing nanoparticles? Classify them on the basis of physical methods, chemical syntheses and mechanical processes. 10

SECTION—B

5. *(a)* Draw the block diagram of digital data acquisition system and explain the essential function of each block and component. 12

(b) Obtain the transfer function $H(s) = \frac{V_o}{V_s}$ for the circuit given below :



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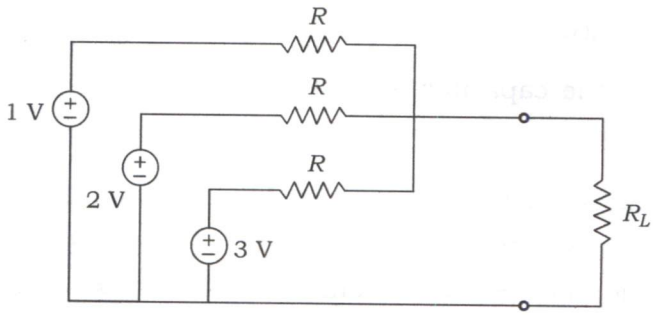
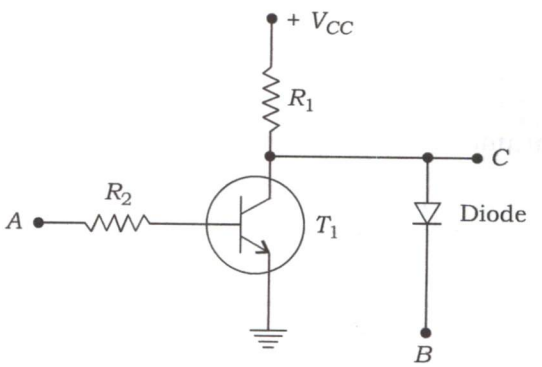
(c) For the given circuit, find the value of R, if the maximum power delivered to the load is 3 mW :



12

(d) The transistor T_1 has negligible collector-to-emitter saturation voltage as shown in the figure below. Also, the diode drops negligible voltage when conducting. If the power supply is +5 V, A and B are digital signals with V_{CC} as logic 1 and 0 V as logic 0, find the Boolean expression for output C :



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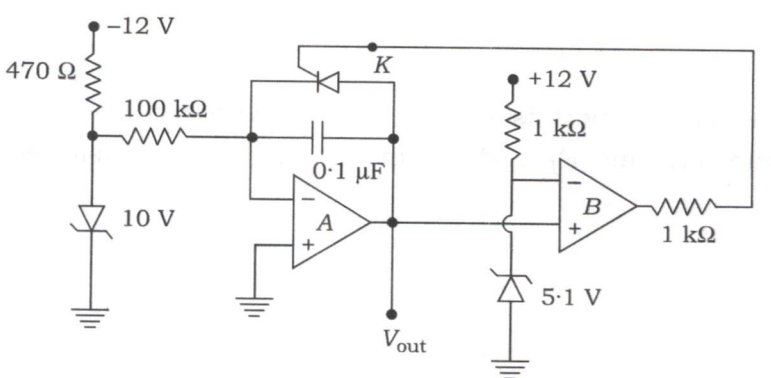
(e) Explain the operation of the circuit shown below. Include a description of its output waveform, including its amplitude and period :



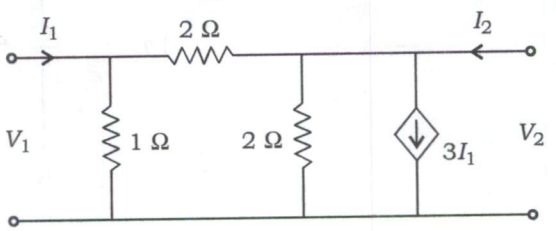
The device which is connected in parallel to the capacitor can be considered a controlled diode which conducts in one direction only, when triggered by a positive trigger at the control input K, and stops conducting when a negative trigger is applied or if the forward bias to it is removed, similar to an SCR. Assume that the capacitor is uncharged initially. 12

6. *(a)* *(i)* Define noise. Explain with examples the generated noise, conducted noise and radiated noise. Describe the techniques used for reducing the magnitude of the above-mentioned categories of noise. 10

(ii) An amplifier whose bandwidth is 100 kHz has a noise power spectrum density input of 7×10^{-21} J. If the input resistance is 50 kΩ and the amplifier gain is 100, what is the noise output voltage? 10

(b) Describe in brief the different methods used for measurement of medium resistances. 20

(c) Find the Z parameters of the network given below :



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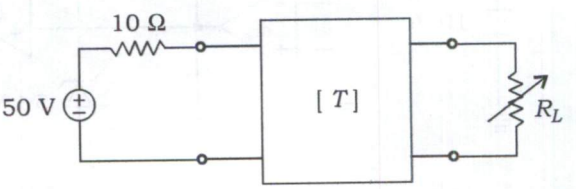
7. *(a)* *(i)* The *ABCD* parameters of the two-port network in the given figure are

$$\begin{bmatrix} 4 & 20\,\Omega \\ 0{\cdot}1\,\text{S} & 2 \end{bmatrix}$$

The output port is connected to a variable load for maximum power transfer. Find R_L and the maximum power transferred :



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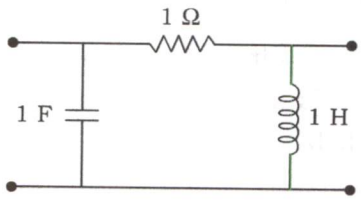
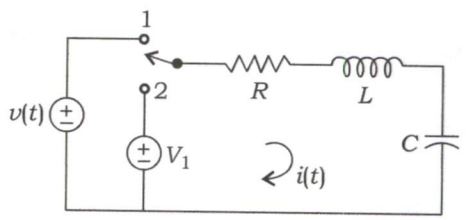
(ii) Find the T network equivalent to the π network given in the figure in s-domain using Laplace transform :



Find the element values for $s = j1$. 5

(b) The switch is moved from position 1 to 2 at $t = 0$ in the following circuit. The initial conditions are specified as $i_L(0_+) = 2$ A, $v_C(0_+) = 2$ V. Find the current $i(t)$ for $t > 0$, assuming $L = 1$ H, $R = 3\ \Omega$, $C = 0 \cdot 5$ F and $V_1 = 5$ V. Use Laplace transform method :



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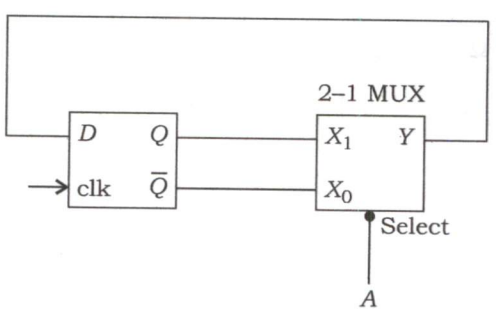
(c) (i) Derive the expressions for the current gain g and the input impedance Z_{in} for a common-collector amplifier. Show the all necessary steps, starting with the circuit diagram (equivalent circuit model) for the derivation. 10

(ii) Draw the state transition diagram for the logic circuit shown below :



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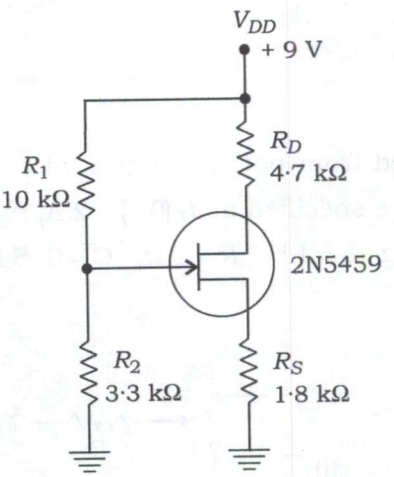
8. *(a)* *(i)* An analog switch uses an *n*-channel MOSFET with $V_{GS(th)} = 4$ V. A voltage of + 8 V is applied to the gate. Determine the maximum peak-to-peak input signal that can be applied, if the drain-to-source voltage drop is neglected.

Also determine the minimum frequency of the pulses applied to the MOSFET gate, if this switch is used to sample a signal with a maximum frequency of 15 kHz. 10

(ii) Determine the maximum I_D and V_{GS} for the circuit given below :



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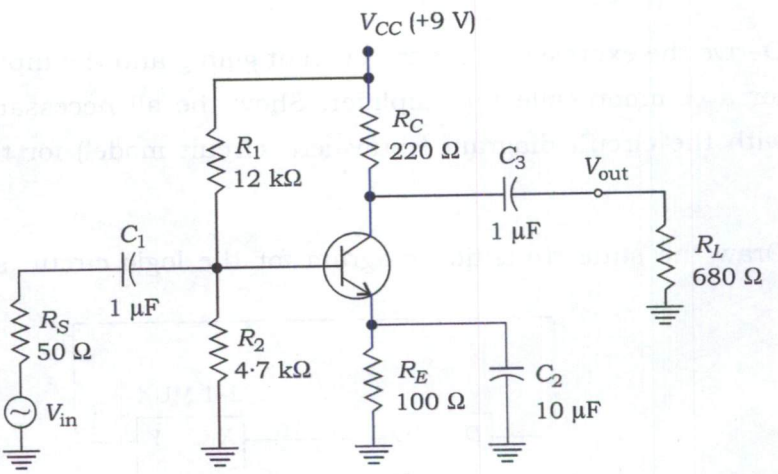
(b) Determine the lower cut-off frequency of the amplifier shown in the figure :



Given, $\beta_{dc} = \beta_{ac} = 125$, $C_{be} = 25$ pF and $C_{bc} = 10$ pF.

Thus, also calculate the voltage gain A_V at lower cut-off frequency. 20

(c) (i) Derive the expressions for stress in an element subjected to biaxial stress. 10

(ii) A simple tension member having an area of 100 mm^2 is subjected to a load of 3000 kg. Strain of 1520 and – 544 microstrain are measured in the axial and transverse directions, respectively. Determine the value of Young's modulus and Poisson's ratio. 10

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SDFG-B-ELX

ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Paper – II

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*Maximum Marks : **300***

Question Paper Specific Instructions

Please read each of the following instructions carefully before attempting questions :

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*Questions No. **1** and **5** are **compulsory** and out of the remaining, any **THREE** are to be attempted choosing at least **ONE** question from each section.*

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*Answers must be written in **ENGLISH** only.*

SECTION A

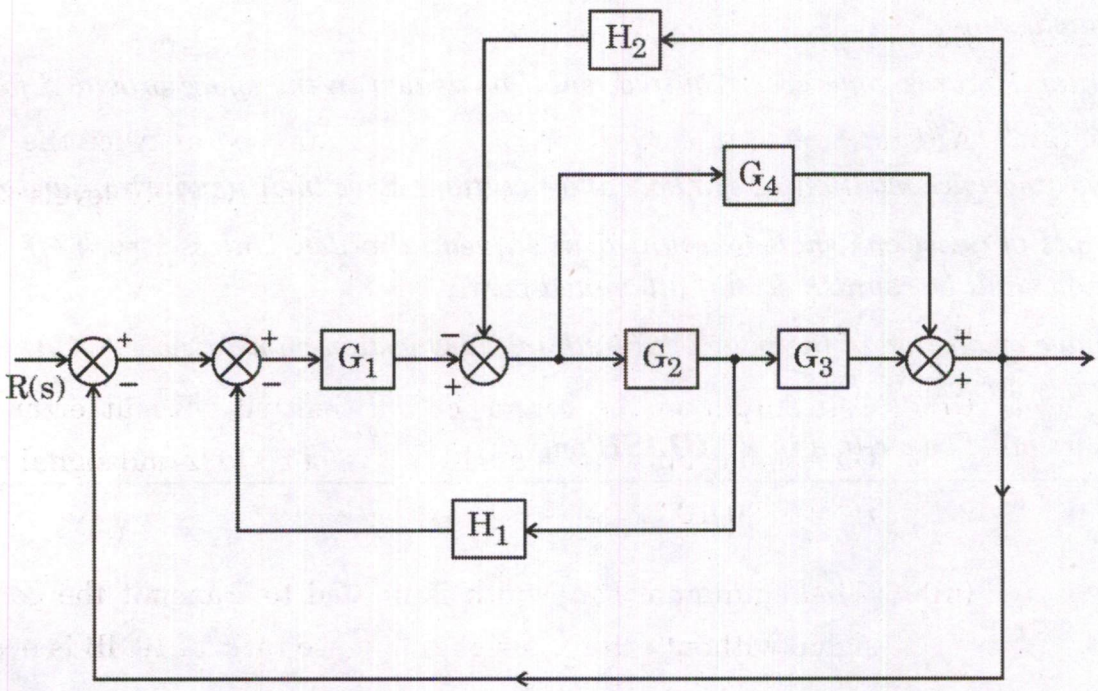
Q1. (a) A band limited random signal X(t) has two-sided power spectral density $S_X(f)$ (PSD) given by *10*

$$S_X(f) = \begin{cases} 10^{-6}(3000 - |f|) \text{ watts/Hz} & \text{for } |f| \leq 3 \text{ kHz} \\ 0, & \text{otherwise.} \end{cases}$$

where f is frequency expressed in Hz.

This signal modulates a carrier $\cos 16000\pi t$ and resultant signal is passed through an ideal band pass filter of unit gain with central frequency of 8 kHz and bandwidth of 2 kHz. Draw two-sided power spectral density diagram for the given signal, modulated carrier and the output of the filter.

(b) Convert the given block diagram to equivalent signal flow graph. Find the transfer function using Mason's Gain Formula. *10*



(c) What do cores mean in a processor ? Differentiate between Multi-core and Many-core architectures. *4+6*

(d) The electric field intensity of a linearly polarized uniform plane wave propagating in the +z direction in sea water is

$$\vec{E} = \hat{a}_x \; 100 \cos (10^7 \pi t) \text{ V/m} \quad \text{at} \quad z = 0.$$

The constitutive parameters of sea water are

$$\varepsilon_r = 72, \; \mu_r = 1, \text{ and } \sigma = 4 \text{ (S/m)}.$$

Determine the intrinsic impedance, wavelength and skin depth. The value of ε_0 may be taken as $8{\cdot}854 \times 10^{-12}$ F/m, and $\mu_0 = 4\pi \times 10^{-7}$ H/m. *10*

(e) An electron beam exposure system operates at 20 kV accelerating voltage. Column length is 70 cm. Spot current is 500 nA, and numerical aperture of the final lens is 10^{-2} rad. The energy spread at the cathode is 0·2 V. If the coefficients of spherical and chromatic aberration are 10 cm and 62·5 cm respectively, determine the resolution limit at the centre of the exposure field. *10*

(f) Between direct modulation and external modulation, which approach would you prefer as a dispersion management solution in case of optical fiber communication and why ? *10*

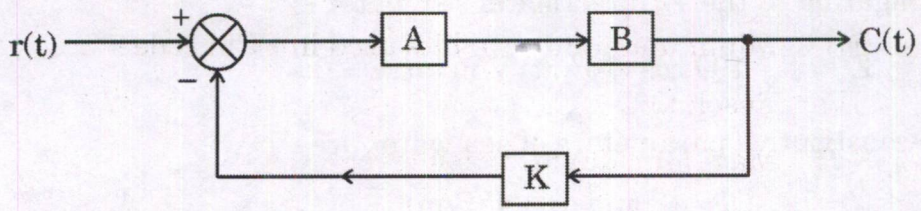
Q2. (a) A band limited analog signal of 5 kHz is sampled at twice the Nyquist rate. Each sample is quantized into 1024 equally likely levels that are statistically independent.

(i) Calculate information rate. *5*

(ii) Can output of the source be transmitted without error over a Gaussian channel with a bandwidth of 50 kHz and signal to noise ratio of 30 dB ? *5*

(iii) What minimum bandwidth is needed to transmit the generated signal without error if a signal to noise ratio of 10 dB is needed to be maintained ? *10*

(b) Consider the block diagram of an LTI system shown below :



Block A has impulse response $h_A(t) = e^{-2t}\, u(t)$.

Block B has impulse response $h_B(t) = e^{-t}\, u(t)$.

Block K is an ideal amplifier of gain 'K'.

(i) Calculate transfer function of the system when K = 1. *5*

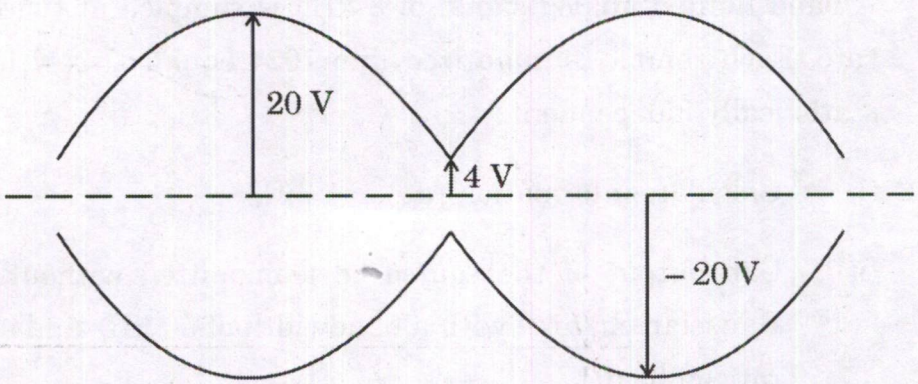
(ii) Find impulse response of the system when K = 0. *5*

(iii) Find the value of K for which the system becomes unstable. *10*

(c) (i) Write a code or pseudocode (in any standard programming language) to swap two numbers without using third variable. *10*

(ii) Write a code or pseudocode (in any standard programming language) to swap two numbers using pointers. *10*

Q3. (a) (i) The AM envelope observed on a CRO is shown below :



Determine the following parameters : *2×5=10*

(I) Peak amplitude of upper and lower sideband

(II) Peak amplitude of the carrier

(III) Peak change in amplitude of modulated carrier

(IV) Modulation index and Modulation efficiency

(V) Power in sideband and total power

(ii) For a PCM system, determine : *2×5=10*

(I) Minimum sampling rate

(II) Minimum number of bits used in PCM code

(III) Resolution

(IV) Maximum quantization error

(V) Coding efficiency

Assume :

Maximum analog input frequency = 4 kHz

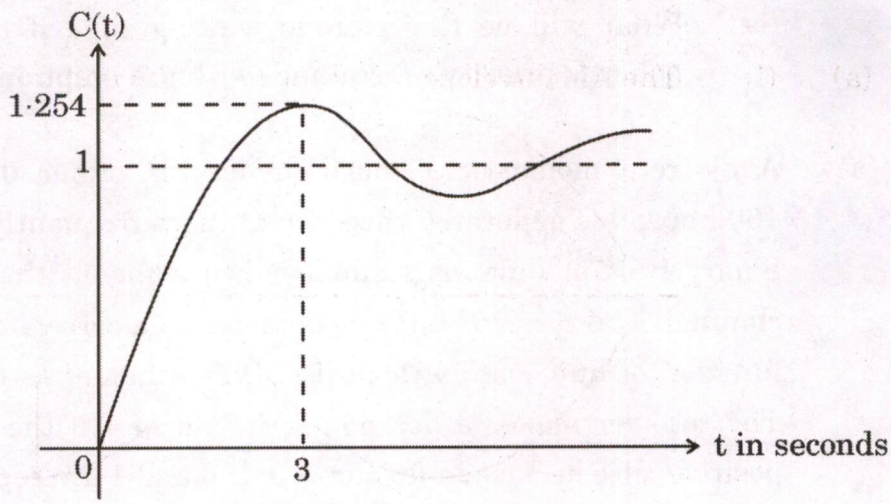
Maximum decoded voltage at $R_X = \pm 2{\cdot}55$ V

Minimum dynamic range = 46 dB

(b) (i) A unity feedback system having forward transfer function

$$G(s) = \frac{K}{s(Ts+1)}$$

is subjected to a unit-step input. Determine the values of K and T from the output response C(t) curve shown below :



Peak-time

Also find the settling time of this system for 2% criterion. *10*

(ii) Design a PD controller so that the system having open loop function $G(s)H(s) = \frac{1}{s(s+1)}$ will have a phase margin of 40° at 2 rad/sec. *10*

(c) Consider a set of 5 processes for which arrival time, CPU time needed and the priority are given below :

Process ↓	Arrival time (ms)	CPU time needed (ms)	Priority
P_1	0	10	5^{th}
P_2	0	5	2^{nd}
P_3	2	3	1^{st}
P_4	5	20	4^{th}
P_5	10	2	3^{rd}

(i) What will be the average waiting time if the CPU scheduling policy is SJF (without pre-emption) ? *5*

(ii) What will be the average waiting time if the CPU scheduling policy is SJF (with pre-emption) ? *5*

(iii) What will be the average waiting time if the CPU scheduling policy is priority scheduling (without pre-emption) ? *5*

(iv) What will be the average waiting time if the CPU scheduling policy is priority scheduling (with pre-emption) ? *5*

Q4. (a) A discrete memoryless source generates either 0 or 1 at a rate of 160 kbps; 0 is generated three times more frequently than 1. A coherent binary PSK modulator is employed to transmit these bits over a noisy channel. The received bits are detected in a correlator fed with the basis function of unit energy (for this BPSK scheme) as the reference signal. The receiver makes a decision in favour of 1 if the correlator output is positive, else decides in favour of 0. If 0 and 1 are represented as

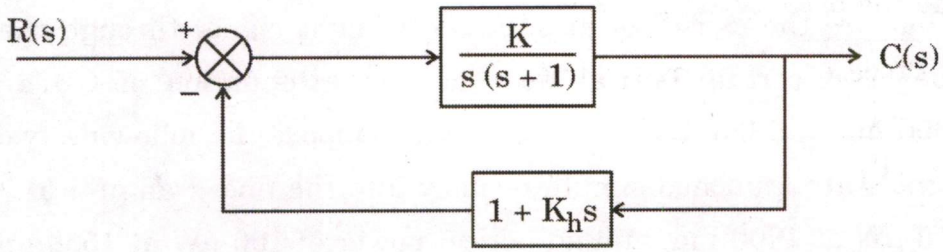
$0 : \rightarrow -(6\sqrt{2}\ \cos 640\ \pi \times 10^3\ t)\ V$

$1 : \rightarrow +(6\sqrt{2}\ \cos 640\ \pi \times 10^3\ t)\ V$

(i) Determine transmitted signal energy per bit. *12*

(ii) Determine basis function of unit energy for this binary PSK scheme. *8*

(b) For the system shown below,



Draw the root-locus with $K_h = 0$ and K as variable. Obtain the value of K so that the system damping ratio is 0·158.

For the obtained value of K, draw the root-locus with K_h as variable. Find the value of K_h that improves the system damping ratio to 0·5. *20*

(c) (i) A processor array has 512 processors. Each processor is capable of adding a pair of integers in 1 μ second. What is the performance (operations per second) of this processor array adding two integer vectors of length 1000, assuming each vector is allocated to the processors in a balanced fashion ? *10*

(ii) A processor array has 512 processors. Each processor is capable of adding a pair of integers in 1 μ second. What is the performance (operations per second) of this processor array adding two integer vectors of length 512, assuming each vector is allocated to the processors in a balanced fashion ? *10*

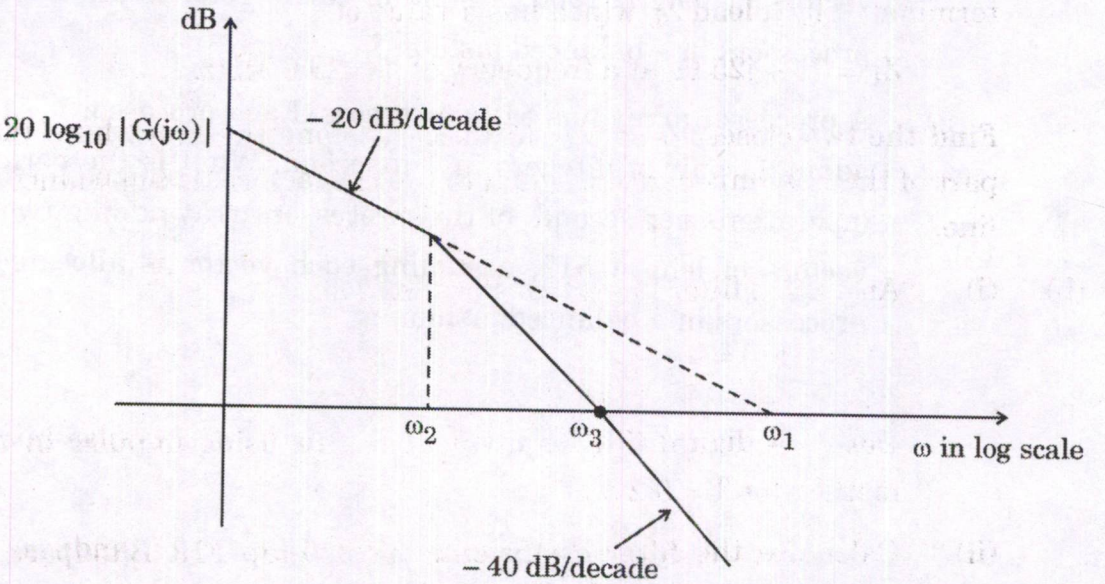
SECTION B

Q5. (a) What are the causes of attenuation of light signal through the optical fiber ? A certain optical fiber has an attenuation of 0·6 dB/km at 1300 nm and 0·3 dB/km at 1550 nm. Suppose the following two optical signals are launched simultaneously into the fiber : an optical power of 150 μW at 1300 nm, and an optical power of 100 μW at 1550 nm. What are the power levels in μW of these two signals at (i) 8 km, and (ii) 20 km ? *10*

(b) Consider the unity-feedback system having forward transfer function

$$G(s) = \frac{K}{s\,(Js + F)}.$$

The Bode plot of G(s) is shown below as asymptotic approximation :



Express the relation between ω_1, ω_2 and ω_3. Also find the static velocity error coefficient K_v of this system. You can assume $\omega_2 << \omega_3$. *10*

(c) The seek time of a disk is 30 ms. It rotates at the rate of 30 rotations per second. Each track has a capacity of 300 words. What will be the access time ? *10*

(d) A wave at 10 GHz propagates in a rectangular waveguide with inner dimensions a = 1·5 cm and b = 0·6 cm. The conductivity of the waveguide walls is $\sigma = 1{\cdot}57 \times 10^7$ S/m. The waveguide is filled with polyethylene with $\varepsilon_r = 2{\cdot}25$ and $\mu_r = 1$.

Calculate the guide wavelength and the wave impedance of the waveguide. Assume that dominant mode is propagating. Also determine the attenuation constant due to loss in the dielectric. The loss tangent of the polyethylene may be taken as 4×10^{-4} and the value of ε_0 is $8{\cdot}854 \times 10^{-12}$ F/m. *10*

(e) What will be the execution time for the instruction "STA addr" of 8085 with a clock frequency of 3 MHz ? Number of T-states required by the instruction is 13. *10*

(f) Illustrate hop-to-hop (node-to-node) delivery by the data link layer. *10*

Q6. (a) A 50 Ω transmission line has phase velocity $v_p = 2{\cdot}1 \times 10^8$ m/s. It is terminated by a load Z_L which has a value of

$$Z_L = 75 + j25\ \Omega \text{ at a frequency of } f = 29{\cdot}6 \text{ MHz.}$$

Find the two closest positions to the load along the line where the real part of the line impedance is equal to the characteristic impedance of the line. *20*

(b) (i) An analog filter has a transfer function

$$H(s) = \frac{10}{s^2 + 7s + 10}$$

Design a digital filter equivalent to this using impulse invariant method for T = 0·2 s. *10*

(ii) Calculate the filter coefficients for a 5-tap FIR Bandpass filter with a lower cut-off frequency of 2 kHz and an upper cut-off frequency of 2·4 kHz at a sampling rate of 8 kHz. *10*

(c) (i) A digital fiber optical link working at 850 nm requires a maximum Bit Error Rate (BER) of 10^{-10} at a Data Rate (DR) of 20 Mbps for a simple binary level signalling scheme. Take detector quantum efficiency as 1. [$h = 6{\cdot}626 \times 10^{-34}$ J.s]

Determine the incident optical power that must fall on the photo detector to achieve the above-mentioned BER and DR. *10*

(ii) An optic fiber system uses a directly-modulated Distributed Feed-Back (DFB) laser as an optical source at the transmitter. If the operating bit rate = 2·5 Gbps, the dispersion parameter = 10 ps/(nm-km) and RMS spectral width of the pulse = 0·15 nm. Determine the maximum transmission distance. *10*

Q7. (a) The scattering matrix of a two-port network is given by

$$[S] = \begin{bmatrix} 0{\cdot}1 \angle 0 & 0{\cdot}8 \angle 90^\circ \\ 0{\cdot}8 \angle 90^\circ & 0{\cdot}2 \angle 0 \end{bmatrix}$$

(i) Determine whether the network is reciprocal or lossless. *5*

(ii) If a short circuit is placed on port 2, what will be the resulting return loss at port 1 ? *15*

(b) Write an 8085 assembly language program to sort N numbers in descending order where value of N is available in memory location 9000 H. Also note that numbers are stored in consecutive memory locations starting from 9001 H. *20*

(c) (i) In the downlink of a GSM system, the carrier frequency is 950 MHz and according to GSM specifications the receiver sensitivity is – 102 dBm. The output power of the transmitter amplifier is 30 W. The antenna gain of the transmitter antenna is 12 dB, and the aggregate attenuation of connectors, combiners, etc. is 7 dB. The fading margin is 12 dB and breakpoint d_{break} is at a distance of 100 m. What distance can be covered ? Take path loss exponent as 3·5. *10*

(ii) It is required to keep track of Mach 8 (1 Mach = 330 m/s) missiles coming towards a ship (positive Doppler shifts only) from a 500 km range with an L-band ($\lambda \approx 30$ cm) radar. The perfect waveform would have its range rate ambiguity beyond Mach 8 and its range ambiguity beyond 500 km. In this scenario, calculate PRF necessary to provide range rate ambiguity and range ambiguity. Also comment upon the result. *10*

Q8. (a) An electric field strength of 10 μV/m is required at a point which is 200 km from a half-wave dipole antenna in the horizontal plane i.e., $\theta = \frac{\pi}{2}$. The antenna is operating in air at 50 MHz.

Calculate the current that must be fed to the antenna. Also find the average power radiated by the antenna. If a transmission line with characteristic impedance $Z_0 = 75\ \Omega$ is connected to the antenna, determine the value of standing wave ratio. *20*

(b) (i) What do you mean by Electro-static Discharge (ESD) ? Why is ESD protection required ? Suggest a protection method for ESD. *10*

(ii) Design a combinational circuit to generate the 9's complement of a BCD digit, using only two NOT gates, two 2-Input OR gates and one 2-Input X-OR gate. *10*

(c) (i) At a distance of 40,000 km from a point on the surface of Earth, a satellite radiates a power of 12 W from an antenna having a gain of 16 dB in the direction of the observer. Determine the flux density at the receiving point, and the power received by an antenna at this point with an effective area of 10 m^2. Express both flux density and power received in decibels as well. *10*

(ii) Consider a satellite uplink has (C/No) of 82·2 dB and downlink has (C/No) of 79·8 dB. Assume bandwidth of the system as 1·2 MHz.

(I) Determine Numeric Value (NV) for each (C/No) value.

(II) Calculate (C/No) for the system (C/No)s.

(III) Determine (C/N) at 1·2 MHz BW. *10*