

(3 Hours)

[ Total Marks : 100

- N.B.** (1) Question No. 1 is **compulsory**.  
 (2) Attempt any **four** questions out of remaining **six** questions.  
 (3) Assume any **suitable** data wherever **required** but justify the **same**.  
 (4) **Figures** to the **right** indicate **full** marks.

1. Answer the following in brief :—
- What is the meaning of 'Avalanche' in the term Avalanche photodiode ? 5
  - Describe three types of optical fibers. For each type give typical core and cladding diameters. Sketch their Refractive Index profile. 5
  - What do you mean by optical wave guide ? How it is different from Electrical Waveguide ? 5
  - Explain spontaneous emission and stimulated emission. 5
2. (a) Derive an expression for Numerical Aperture of optical fiber in terms of Refractive Indices. 10  
 A silica optical fiber with a core diameter large enough to be considered by Ray Theory analysis has a core Refractive Index of 1.50 and cladding Refractive Index of 1.47.  
 Determine : (i) The critical angle at the core-cladding Interface.  
 (ii) The Numerical Aperture for fiber.  
 (iii) The Acceptance Angle in Air for the fiber.
- (b) Explain the 'Different Modes' that can be supported by an optical fiber. 10
3. (a) Compare and contrast, using suitable diagrams, the Outside Vapour-Phase Oxidation (OVPO) process and the Modified Chemical Vapour Deposition (MCVD) technique for preparation of Low Loss optical fibers. 10
- (b) Describe, with the aid of suitable diagrams, three Common Techniques used for the Mechanical splicing of optical fibers. 10
4. (a) When a light pulse propagates through the optical fiber, attenuation of the signal (light pulse) takes place. 10  
 List the Important factors responsible for Power Loss in optical fiber. Explain each factor in brief.
- (b) A Multimode step Index fiber has a Numerical Aperture of 0.3 and a core Refractive Index of 1.45. 10  
 The material dispersion parameter for the fiber is  $250 \text{ ps nm}^{-1} \text{ km}^{-1}$  which makes material dispersion the totally dominating intramodal dispersion mechanism.  
 Estimate : (i) The Total RMS pulse broadening per kilometer when the fiber is used with an LED source of RMS spectral width 50 nm and. (ii) The corresponding Bandwidth-length product for the fiber.
5. (a) Explain and compare pin diodes with Avalanche Photo Diode (APD) with the help of suitable Electric field diagrams. 10
- (b) With the help of receiver configuration circuit diagram, explain the working of optical receiver. Also derive the expression for output pulse. 10

5. (a) Explain and compare pin diodes with Avalanche Photo Diode (APD) with the help of suitable Electric field diagrams. 10
- (b) With the help of receiver configuration circuit diagram, explain the working of optical receiver. Also derive the expression for output pulse. 10
6. (a) List the important point-to-point link design used in optical communication. Explain each in brief. 10
- (b) Explain with suitable diagram the Cutback Method for total fiber attenuation measurement. 10
7. Write short notes on any **three** of the following :— 20
- (a) Wavelength Division Multiplexing (WDM)
  - (b) Linearly Polarised Modes
  - (c) Optical Time Domain Reflectometer (OTDR)
  - (d) LASER Diode.
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Con. 5620-10.

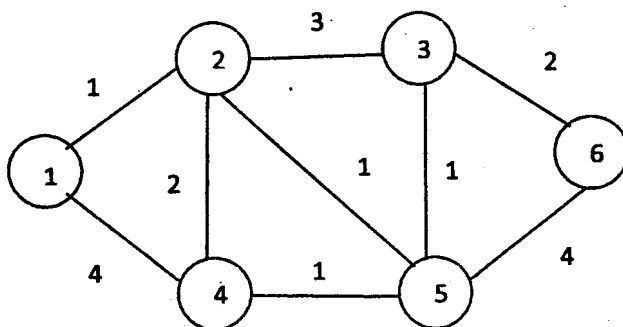
GT-8550

(3 Hours)

[Total Marks : 100]

- N.B. :** (1) Question No. 1 is **compulsory**.  
 (2) Attempt any **four** questions out of remaining **six** question.  
 (3) Assume data wherever **necessary**. But state the assumption **clearly**.

1. (a) Data to be sent is  
 011101111111011110111  
 Perform Bit oriented framing. [5]
- (b) Explain how flow control is achieved in TCP. [5]
- (c) In a LAN which protocol has higher efficiency: ALOHA or CSMA-CD? Explain. [5]
- (d) A small organization has a Class C address for seven networks each with 24 hosts.  
 What is an appropriate subnet mask? [5]
2. (a) Explain HDLC frame format [14]
- (b) The codeword is received as T=1010 0011 0101 1110. Check whether there are errors in the received code word if the divisor is 110101.[06]
3. (a) Explain Spanning tree algorithm with reference to frame forwarding , address learning and loop resolution. [10]
- (b) Explain various transmission media in detail. [10]
4. (a) For the graph shown in the figure show the successive iterations of the Bellman Ford's method of Shortest path Algorithm. Take node 1 as the root node.[10]



- (b) Show that hierarchical routing in IP reduces the table sizes at router as compared to flat addressing. [10]
5. (a) Explain SONET multiplexing and Frame structure. [10]
- (b) Compare packet switching, Circuit switching and cell switching.[10]
6. (a) Explain DHCP and Border gateway protocol.[10]
- (b) Explain ARP and RARP . [10]
7. Write a short note on :- [20]
- (a) ATM networks
- (b) TCP vs UDP

Con. 5878-10.

## Satellite Com.

GT-8565

(3 Hours)

[ Total Marks : 100

- N.B.:** (1) Question No. 1 is **compulsory**.  
 (2) Attempt any **four** questions from question Nos. 2 to 7.  
 (3) Draw neat **sketches / diagrams** wherever **necessary**.

1. (a) State and explain Kepler's laws. 10  
 (b) What do you understand by reliability and space qualification ? Explain significance of bath tub curve. 10
2. (a) Explain the frame structure of demand assignment TDMA scheme. 10  
 (b) Compare and contrast low altitude, medium altitude and high altitude satellites. 10
3. (a) Explain effect of earth's oblateness on the orbital inclination of geosynchronous satellites. 10  
 (b) Explain Telemetry, Tracking and Command subsystem of satellite. 10
4. (a) Explain single conversion as well as double conversion transponder. Discuss advantages and disadvantages. 10  
 (b) What are different methods of launching a satellite ? Explain one method in detail. 10
5. (a) Explain effect of rain on satellite link. 5  
 (b) Explain sun transit outage. 5  
 (c) Why are polar orbits not used for communication satellites. 5  
 (d) Explain intermodulation noise. 5
6. (a) Draw block diagram of transmit receive type earth station. Explain each block in detail. 10  
 (b) Derive general link equation. Find expression for C/N and G/T ratio. What is importance of these factors on satellite link design ? 10
7. Write short notes on the following :— 20
  - (a) Large Cassegrain antenna
  - (b) SPADE system
  - (c) Limits of visibility
  - (d) Feed system in earth station antennas.

Con. 6237-10.

(3 Hours)

[ Total Marks : 100

- N.B. :** (1) Question No. 1 is **compulsory**.  
(2) Attempt any **four** questions from the remaining.  
(3) Assume **suitable** data if **necessary**.  
(4) **Illustrate** answers with sketches whenever **required**.  
(5) **Figures** to the **right** indicate **full** marks.

1. Answer any **four** :- 20
- (a) Explain the turn on and turn off characteristics of SCR.
  - (b) Explain the triggering circuit using IC TBA 785.
  - (c) Need of cooling of a power device in detail.
  - (d) What is inverter? Explain voltage commutated inverter with neat diagram.
  - (e) Draw and explain the operating regions of IM with the help of torques - speed characteristics.
  - (f) Draw and explain two quadrant chopper operation.
2. (a) Explain the operating modes of TRIAC. Draw and explain the operation of fan regulator circuit with DIAC - TRIAC arrangement. 10
- (b) Explain the pulse triggering method using UJT synchronized circuit for full wave configuration with suitable waveforms. 10
3. (a) Draw and explain series inverter circuit with suitable waveforms. Also state the limitations of series inverter. 10
- (b) Draw and explain auxiliary commutated single phase bridge inverter by using some suitable voltage and current waveforms. 10
4. (a) Explain the operation of Jones chopper alongwith the waveforms at - 10
- (i) Voltage at main SCR & current
  - (ii) Voltage and current at auxiliary SCR
  - (iii) Voltage across capacitor
  - (iv) Voltage across load.
- (b) Derive the expressions for commutating components L & C for a voltage commutated chopper. Also, discuss the assumptions made for designing the components. 10
5. (a) Draw the neat diagram for 3- $\phi$  semiconverter feeding highly inductive load. Assuming continuous and ripple free output current. Draw the output voltage waveforms for  $\alpha = 30^\circ$ , measured from natural angle delay i.e.  $\pi/6$ . Clearly show the conducting sequence of the devices. 10
- (b) In single phase fully controlled bridge rectifier feeding with active load. Derive and draw the necessary waveforms - 10
- (i) Average load voltage
  - (ii) Average and rms load current.

5. (a) Draw the neat diagram for 3- $\phi$  semiconverter feeding highly inductive load. Assuming continuous and ripple free output current. Draw the output voltage waveforms for  $\alpha = 30^\circ$ , measured from natural angle delay i.e.  $\pi/6$ . Clearly show the conducting sequence of the devices. 10
- (b) In single phase fully controlled bridge rectifier feeding with active load. Derive and draw the necessary waveforms – 10
- (i) Average load voltage
  - (ii) Average and rms load current.
6. (a) Explain the slip-power recovery scheme in a.c. drives. 10
- (b) Draw and explain the power ckt. of semiconverter feeding separately excited d.c. motor. Explain with typical voltage and current waveforms, the operation in continuous and discontinuous armature current mode. 10
7. Write short notes on any **four** :- 20
- (a) Effect of source inductance on output voltage of FWCR
  - (b) V-I characteristic of SCR
  - (c)  $\frac{dv}{dt}$  and  $\frac{di}{dt}$  protection circuits.
  - (d) Parallel inverter
  - (e) V/f control for IM.

- N.B. :** (1) Question No. 1 is **compulsory**.  
 (2) Attempt any **four** out of remaining **six** questions.  
 (3) Assume **suitable** data wherever **necessary**.

1. (a) Explain reach and stroke of a robot. 5  
 (b) Discuss Total Work Envelope (TWE) and Dexterous Work Envelope (DWE). 5  
 (c) Compare area and line descriptors. 5  
 (d) Differentiate between hard and soft automation. 5
2. (a) Explain D-H algorithm. Develop D. K. analysis of 4 axis SCARA robot. 15  
 (b) Explain composite rotation matrix (CRM) algorithm. 5
3. (a) Discuss work envelope of a 4 axis SCARA robot. 10  
 (b) Develop IK analysis of 2-axis planar articulated Robot. 10
4. (a) Explain how straight line motion can be obtained using an articulated robot. 10  
 (b) Explain linear interpolation with parabolic blends. Discuss its advantages over piecewise linear interpolation. 10

5. (a) 10

0	0	1	1	0	0
1	1	1	1	1	1
0	0	1	1	0	0

For the above image, calculate area, centroid, first order moments, second order moments, central moments and principal angle.

- (b) Discuss edge detection technique. Explain the significance of edge threshold. 10
- (a) Compare the joint variable vector  $q = [q_1, q_2, q_3, q_4]^T$  for the following TCV of SCARA.  $w(q) = [203.4, 662.7, 557, 0, 0, -1.649]^T$ . 10  
 (b) Explain the effect of Moment of Inertia on the dynamic performance of a robot. 10

- Short notes on :- 20
- (a) Shrink and Swell operators  
 (b) Gross motion planning  
 (c) Robot classification.