

22647

21222

3 Hours / 70 Marks

Seat No.

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15 minutes extra for each hour

- Instructions :**
- (1) All Questions are *compulsory*.
 - (2) Answer each next main Question on a new page.
 - (3) Illustrate your answers with neat sketches wherever necessary.
 - (4) Figures to the right indicate full marks.
 - (5) Assume suitable data, if necessary.
 - (6) Use of Non-programmable Electronic Pocket Calculator is permissible.

Marks

1. Attempt any FIVE of the following :

10

- (a) State two advantages and two disadvantages of fiber optics cable.
- (b) Define : (i) Critical Angle (ii) Acceptance Angle.
- (c) List the types of optical splitters.
- (d) State the specification of 802.3j (any 4).
- (e) State reason for difference in uplink and downlink frequency in satellite communication.
- (f) Define following terms w.r.t. satellite :
(i) footprint (ii) Elevation Angle.
- (g) Define EIRP.
- (h) List the different applications of satellite communication.

2. Attempt any THREE of the following :

12

- (a) Explain inter modal & intra modal dispersion in optical fibre with neat diagram.
- (b) State the types of optical amplifier. Explain any one.
- (c) Differentiate between LED and LASER (any eight points).
- (d) Explain : Ethernet standards of optical network in detail.

- 3. Attempt any THREE of the following : 12**
- (a) Define geostationary orbit and geostationary satellite and state advantages of geostationary orbit/satellite.
 - (b) Define optical switch. State its types.
 - (c) With neat sketch describe the operation of PIN photodiode.
 - (d) Draw block diagram of OTDR and explain its working.
- 4. Attempt any THREE of the following : 12**
- (a) Describe absorption and coupling losses in optical fiber.
 - (b) Write uplink and downlink frequency for C-band, X-band, K_n -band and K_a -band.
 - (c) A fiber has a core diameter of 2 μm and its core R.T. is 1.43. The refractive index of cladding is 1.415. Determine : (i) numerical aperture (ii) critical angle (iii) Acceptance angle (iv) Relative refractive index difference.
 - (d) List different types of losses occurring in a satellite link and explain any one in detail.
 - (e) Draw the block diagram of telemetry tracking and command subsystem and state its principle of operation.
- 5. Attempt any TWO of the following : 12**
- (a) Draw block diagram of fiber optic communication system and list out optical sources and detectors suitable for fiber optic communication.
 - (b) State different types of splicing technique. State in which technique electric arc is used for splicing the fibre & explain the method in detail with neat diagram.
 - (c) Explain SONET architecture with neat diagram.
- 6. Attempt any TWO of the following : 12**
- (a) Draw the block diagram and explain the operation of GPS transmitter and GPS receiver.
 - (b) Describe the effect of non-spherical nature of earth on the orbital inclination of geosynchronous satellite.
 - (c) Explain working principle of VSAT and state its application.
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12223

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 - (3) Illustrate your answers with neat sketches wherever necessary.
 - (4) Figures to the right indicate full marks.
 - (5) Assume suitable data, if necessary.

Marks

1. **Attempt any FIVE of the following :**

10

- (a) Draw frequency spectrum of optic fiber communication.
- (b) Define numerical aperture and give its mathematical expression.
- (c) Define :
 - (i) Look angle
 - (ii) Foot print
- (d) List various elements of the transponder.
- (e) State uplink and down link frequencies for C Band and X Band.
- (f) List the types of optical switches.
- (g) Specify the function of telemetry and tracking control subsystem in satellite communication.



- 2. Attempt any THREE of the following :** **12**
- (a) Explain how power is generated in satellite and how it is distributed to other sub-system of satellite.
 - (b) Explain the following terms :
 - (i) Apogee
 - (ii) Perigee
 - (c) Explain working of VSAT.
 - (d) With the help of ray diagram explain the concept of total internal reflection used in optical fiber.
- 3. Attempt any THREE of the following :** **12**
- (a) In comparison to traditional communication system, state any four advantages which proves optical communication system to be superior.
 - (b) Map the satellite services with the frequency band used for it.
 - (c) Explain with diagram wave division multiplexing process.
 - (d) Explain the technique used for joining two fiber optic cables.
- 4. Attempt any THREE of the following :** **12**
- (a) Explain the working of satellite transponder.
 - (b) Draw and explain working of avalanche photodiode.
 - (c) Explain absorption loss. State types of absorption losses.
 - (d) Explain the operation of OTDR.
 - (e) "Optical communication uses optical switch." Explain the above statement with its working principle.

5. Attempt any TWO of the following :**12**

- (a) Explain SONET/SDH architecture with neat diagram.
- (b) State the function of following in satellite :
 - (i) Propulsion control
 - (ii) LNA
 - (iii) Altitude control
- (c) Explain how is geostationary orbit and geostationary satellite different from LEO.

6. Attempt any TWO of the following :**12**

- (a) State the reason for occurrence of following losses in satellite :
 - (i) Feeder losses
 - (ii) Antenna misalignment losses
 - (iii) Ionosphere losses
 - (b) State two distinguishing features of following standards :
 - (i) IEEE 802.3j
 - (ii) IEEE 802.3y
 - (iii) IEEE 802.3z
 - (c) Silica optical with core diameter large enough to be considered by ray theory analysis has core refractive index of 1.50 and cladding refractive index of 1.47. Calculate
 - (i) Critical angle
 - (ii) Numerical Aperture of fiber
 - (iii) Acceptance angle in air for fiber
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