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3 Hours / 70 Marks

Seat No.

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- 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.
(7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.
(8) Use of Steam tables, logarithmic, Mollier's chart is permitted.

Marks

1. Attempt any FIVE of the following : 10
- a) Define Geostationary satellite and Geosynchronous satellite.
 - b) State need for optical fiber communication.
 - c) Define the concept of pulse broadening in optical cable.
 - d) State the function of following in satellite
 - i) Propulsion control
 - ii) Low Noise Amplifier (LNA)
 - e) Define insertion loss in optical fiber.
 - f) Define eye diagram in optical communication system with features and diagram.
 - g) Define concept of rain attenuation in satellite.

P.T.O.

2. Attempt any THREE of the following :

- Describe Kepler's three laws of satellite motion.
- Name the block diagram shown in Figure No. 1
 - Identify the block A and B, C in the given block diagram.
 - State the function of block A and B (Refer figure) and Block C

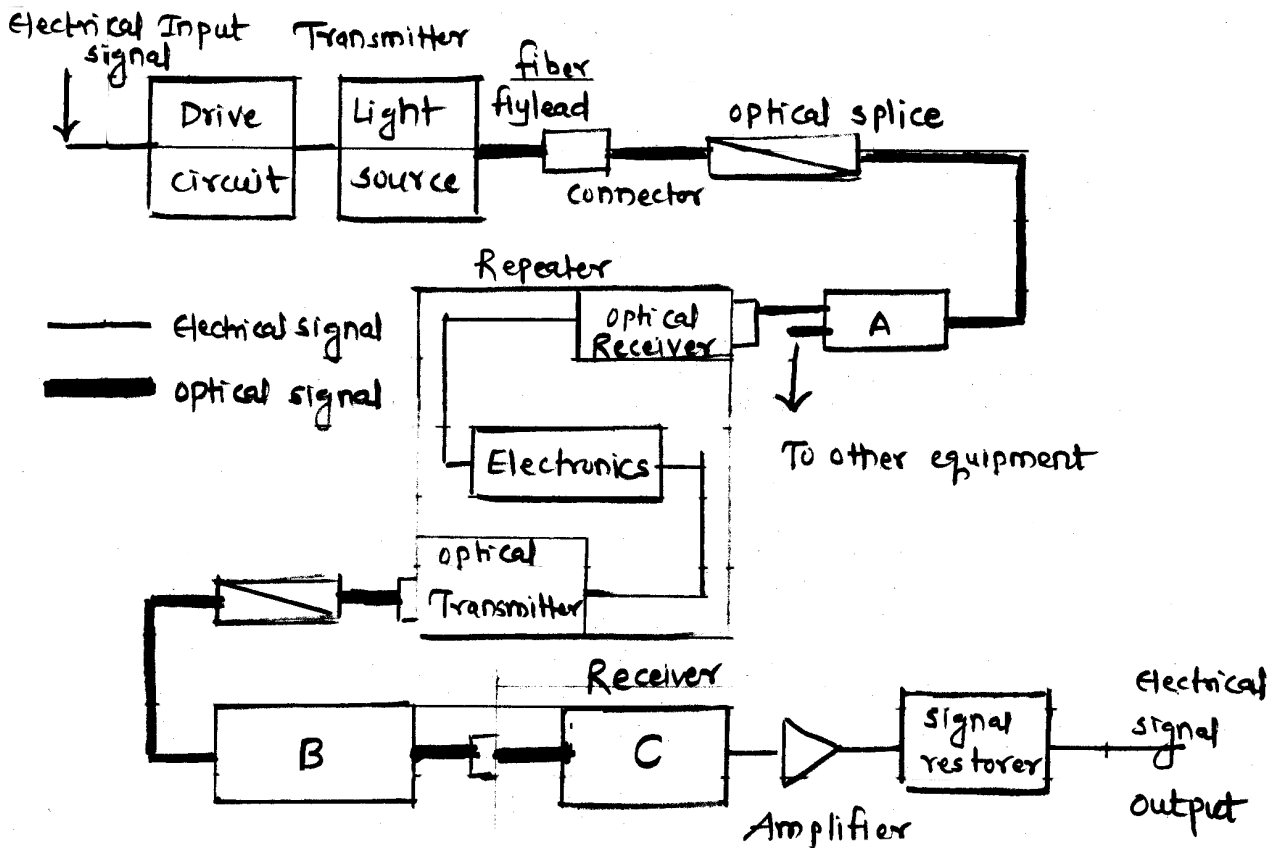


Fig. No. 1

- Explain PC-PC communication using satellite space link with neat sketch.
- Define Link Power Budget in optical fiber communication, Give the equation of link power budget and signify each term. Also state significance of link power budget calculations.

3. Attempt any THREE of the following : 12

- a) A step index fiber has core refractive index 1.482 and cladding refractive index 1.474 calculate numerical aperture, acceptance angle and critical angle.
- b) An earth station is located at 30° west in longitude at 60° north in latitude then determine Azimuth, elevation angles of earth station w.r.t. geostationary satellite which is located at 50° west in longitude. The orbit radius is 42,164 km. Assume radius of earth = 6378 km
- c) Describe the working principle of PIN photodiode with neat sketch.
- d) Compare dispersion loss and coupling loss in optical fiber. (Any four points)

4. Attempt any THREE of the following : 12

- a) State need of splicing. Explain any one type of splicing in detail with neat sketch.
- b) State the optical fiber based on mode of propagation of light used for following applications.
 - i) FTTH
 - ii) Long-haul systems
 - iii) Campus backbone
 - iv) Data centers
- c) Describe the transmission losses in optical fiber cable.
- d) Describe working principle and characteristics of Edge emitting LED with neat sketch.
- e) Explain working principle of OTDR with the help of relevant diagram.

5. Attempt any TWO of the following : 12

- a) List the types of orbits used in satellite system and describe them with neat sketch.
- b) With suitable applications, explain the role of optical couplers, isolators, circulators and optical routers in an optical communication system.
- c) i) Draw and explain block diagram of satellite earth station.
ii) Explain block diagram of wideband receiver in satellite communication with neat sketch.

6. Attempt any TWO of the following : 12

- a) Derive combined uplink and downlink carrier to Noise (C/N) ratio with neat sketch. In a certain satellite communication link, the uplink carrier to noise ratio is 25 dB whereas downlink carrier to noise ratio is 20 dB. Find the link carrier to noise ratio.
 - b) i) Write short note on optical n/w ethernet standard.
ii) Compare Raman Amplifier and Erbium Doped Fiber Amplifier (EDFA). (Any six point)
 - c) i) Identify the need of VSAT in communication. List the advantages and disadvantages of VSAT systems.
ii) Draw the block diagram of GPS system with Transmitter and receiver section. Also list meteorology applications of satellite.
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