

**NTK/KW/15/7532/7540**

**Faculty of Engineering & Technology  
Seventh Semester B.E.(Electronics Engg.)  
ET/EC(C.B.S.) Examination  
OPTICAL COMMUNICATION**

Time—Three Hours]

[Maximum Marks—80

**INSTRUCTIONS TO CANDIDATES**

- (1) All questions carry marks as indicated.
- (2) Solve Question No. **1** **OR** Questions No. **2**.
- (3) Solve Question No. **3** **OR** Questions No. **4**.
- (4) Solve Question No. **5** **OR** Questions No. **6**.
- (5) Solve Question No. **7** **OR** Questions No. **8**.
- (6) Solve Question No. **9** **OR** Questions No. **10**.
- (7) Solve Question No. **11** **OR** Questions No. **12**.
- (8) Due credit will be given to neatness and adequate dimensions.
- (9) Assume suitable data wherever necessary.
- (10) Illustrate your answers wherever necessary with the help of neat sketches.

- (iii) Overall signal attenuation for a 10 km optical link using the same fiber with splices at 1 km intervals each giving an attenuation of 1 dB.

6

5. (a) Discuss different types of optical connectors used in optical communication. 7
- (b) What is Splicing ? Explain the basic Splicing Techniques used. 7

**OR**

6. (a) Draw and explain Surface Emitter LED. State its advantages and disadvantages. 7
- (b) A single mode fiber has the following parameters :
- (1) Normalised Frequency ( $v$ ) = 2.40
  - (2) Core Refractive Index ( $n_1$ ) = 1.46
  - (3) Core Diameter ( $2a$ ) =  $8 \mu\text{m}$ .
  - (4) Numerical Aperture (NA) = 0.1

Estimate the total insertion loss of fiber joint with a lateral misalignment of  $1 \mu\text{m}$  and angular misalignment of  $1^\circ$ . 7

7. (a) Explain the working principle of Avalanche Photo diode and draw its equivalent circuit. 7

- (b) A photo diode has quantum efficiency of 65% when photon of energy  $1.5 \times 10^{-19} \text{ J}$  are incident upon it.

Calculate :

- (i) At what wavelength is the photo diode operating.
- (ii) Responsivity of Photodiode.
- (iii) Calculate the incident optical power required to obtain a photocurrent of  $2.5 \mu\text{A}$ . When the photodiode is operating as described above. 6

**OR**

8. (a) Define the terms Quantum Efficiency and Responsivity of a photodetector and obtain a relationship between them. 7
- (b) Draw the block diagram of Typical Optical Receiver and explain its working in detail. 6
9. (a) Explain the block diagram of basic element of analog link. 7
- (b) With a neat block diagram explain multichannel amplitude modulation. 6

**OR**

1. (a) Write the help of a ray diagram, show how optical fibers can guide light waves. 7
- (b) Write the advantages and disadvantages of optical fiber communication. 6

**OR**

2. (a) For a step index fiber prove that  $NA = n_1 (2\Delta)^{1/2}$  7
- (b) Classify optical fiber in detail. 6
3. (a) What are the requirements for selecting material for optical fiber. What are the different fiber materials used ? 7
- (b) Explain Double Crucible Method of fiber fabrication with neat diagram. 6

**OR**

4. (a) Discuss bending loss and dispersion in optical fiber in short. 7
- (b) When the mean optical power launched in an 8 km length of fiber is  $120 \mu\text{W}$ , the mean optical power at the fiber output is  $3 \mu\text{W}$ .  
Determine :
  - (i) The overall signal attenuation or loss in decibels through the fiber assuming there are no connectors or splices.
  - (ii) The signal attenuation per kilometer for the fiber.

10. (a) Explain point to point link. 7
- (b) What are the different system considerations for designing a digital transmission system. (digital link) ? 6

11. (a) With the help of neat block diagram, explain the working of WDM system. 7
- (b) Explain the Semiconductor Optical Amplifier. Also state the characteristics and types of Optical Amplifier. 7

**OR**

12. (a) Explain the Erbium-doped optical amplifiers. State the advantages and disadvantages. 7
- (b) Describe the cut-back method for Measuring Total Transmission Loss of fiber link. 7