

Total No. of Questions : 6]  
**P597**

SEAT No. :

[Total No. of Pages : 2

**BE/Insem/APR - 203**  
**B.E. (E & TC)**  
**BROADBAND COMMUNICATION SYSTEMS**  
**(2015 Pattern) (Semester - II)**

*Time : 1 Hour]*

*[Max. Marks : 30*

*Instructions to the candidates :*

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 5) *Assume suitable data, if necessary.*

**Q1)** a) What are Graded Index Fibers? Explain with diagram how ray transmission takes place in GI Fiber. **[4]**

b) A multimode step index fiber having the core refractive index of 1.5, cladding refractive index of 1.38, core radius of  $25\mu\text{m}$  operates at wavelength of  $1300\text{nm}$ . **[6]**

Calculate :

- i) Numerical Aperture
- ii) Normalized Frequency
- iii) Total number of modes in the fiber.

OR

**Q2)** a) Enlist & explain any four losses in optical fiber. **[4]**

b) Compare PIN photo diode & APD on the following points. **[6]**

- i) Responsivity
- ii) Speed
- iii) Sensitivity

**P.T.O.**

- Q3)** a) Explain key system requirements to establish point-to-point optical fiber link. [4]
- b) A 1550 nm single mode digital fiber optic link needs to operate at 622 Mbps over 80 km without amplifier. A single mode laser launches an average optical power of 13dBm into the fiber. The fiber has a loss of 0.35 dB/km and there is a splice with loss of 0.1 dB every kilometer. The coupling loss at the receiver is 0.5 dB and the receiver uses an InGaAs APD with a sensitivity of -31 dBm. Excess noise penalties are predicted to be 1.5 dB. Set up an optical power budget for this link and find the system margin. [6]

OR

- Q4)** a) Explain lateral and angular misalignment losses in fiber, with diagram. [4]
- b) Digital optical fiber link has following rise time components.  
Source LED : 8 nsec  
Fiber cable : intermodal 9 ns/km.  
Intra modal : 2 ns/km  
Detector (APD) : 3 nsec  
The desired link length without repeaters is 5 km and the required optical bandwidth is 6 MHz. Determine system rise time. [6]
- Q5)** a) What is WDM? Enlist applications & components for WDM. [4]
- b) A four port multimode fiber FBT coupler has 60  $\mu\text{W}$  optical power launched into port 1. The measured output power at ports 2, 3 and 4 are 0.004, 26.0 and 27.5  $\mu\text{W}$  respectively. Determine the excess loss, the insertion losses between the input and output ports, the cross talk and the split ratio for the device. [6]

OR

- Q6)** a) Explain working principle of Fiber Bragg Grating. [4]
- b) Compare the following optical amplifiers based on working principle, amplification gain and drawbacks. [6]
- i) SOA
  - ii) EDFA

