

Total No. of Questions :6]

SEAT No. :

P138

APR. -16/BE/Insem. - 45

[Total No. of Pages :2

B.E. (E&TC)

BROADBAND COMMUNICATION SYSTEMS

(2012 Course) (404190) (Semester - II)

Time : 1Hour]

[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) Figures to the right indicate full marks.*
- 3) Neat diagrams must be drawn whenever necessary.*
- 4) Assume suitable data, if necessary.*

- Q1)** a) Compare & contrast single mode step index fiber, Multi mode step index fiber and multi mode graded index fiber sketch index profile for each of the above fiber. **[6]**
- b) A multi mode step index fiber with core diameter of $80\mu\text{m}$ and relative index difference of 1.5% is operating at a wavelength of $0.85\mu\text{m}$. If the core refractive index is 1.48 estimate the normalized frequency for the fiber and the number of modes guided. **[4]**

OR

- Q2)** a) Describe the following terms with respect to optical fiber. **[6]**
- i) Attenuation
 - ii) Absorption
 - iii) Scattering
 - iv) Dispersion
- b) A multimode silica fiber has core refractive index 1.48 and cladding refractive index 1.46 calculate critical angle & numerical aperture. **[4]**
- Q3)** a) An optical fiber link of length 4 km comprises a fiber cable with an attenuation of 5dB/km. The splice losses for the link are estimated at 2dB/km, and the connector losses at the source and detector are 3.5 and 2.5 dB respectively. Ignoring the effects of dispersion on the link determine the total channel loss. **[3]**

P.T.O.

- b) For a digital link using optical fiber, LED with its driver circuit has rise time of 15ns, Taking a typical LED spectral width of 40nm, a material dispersion related rise - time degradation of 21 ns over the 6 km link. Modal dispersion induced fiber rise - time is 3.9 nsec. Assuming that receiver has 25MHz bandwidth, the contribution to the rise-time degradation from receiver is 14 nsec. Calculate link rise - time. Hence find which data format is supported NRZ or RZ? [3]
- c) Enlist the components contributing to system rise - time for a digital link. Write the formula for total system rise - time. [4]

OR

- Q4)** a) Explain key system requirements to establish point to point link. [6]
- b) Enlist & Explain different fiber misalignment losses. [4]
- Q5)** a) Explain operational principle of WDM. Support your answer with suitable diagram. [4]
- b) A 2×2 biconical tapered fiber coupler has an i/p optical power level of $P_0 = 200\mu\text{W}$. The output powers at the other three ports are $P_1 = 90\mu\text{W}$, $P_2 = 85\mu\text{W}$ and $P_3 = 63\mu\text{W}$. Calculate coupling ratio (splitting ratio), excess loss, insertion loss and cross talk for the coupler. [6]

OR

- Q6)** a) Write short note on semiconductor optical amplifier. [4]
- b) Explain application of FBG as demultiplexer for WDM system. [6]

