APR. -16/BE/Insem. - 45

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 80μm and relative index difference of 1.5% is operating at a wavelength of 0.85μm. If the core refractive index is 1.48 estimate the normalized frequency for the fiber and the number of modes guided. **[4]**

<div align="center">OR</div>

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]**

<div align="right">*P.T.O.*</div>

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. Model 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 $P_0 = 200\mu W$. The output powers at the other three ports are $P_1 = 90\mu W$, $P_2 = 85\mu W$ and $P_3 = 63\mu W$. 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]**

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