

Code No: **R41041****R10****Set No. 1****IV B.Tech I Semester Supplementary Examinations, March - 2017****OPTICAL COMMUNICATIONS****(Electronics and Communication Engineering)****Time: 3 hours****Max. Marks: 75****Answer any FIVE Questions****All Questions carry equal marks**

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- 1 a) Discuss briefly the advantages of optical fiber communication.  
b) Derive the Numerical Aperture of a step index fiber (SIF) from Snell's law.
- 2 Define a) Cut off wavelength b) Mode Field Diameter c) Effective Refractive Index
- 3 a) Explain what is material dispersion? Derive an expression for material dispersion starting from the expression for group delay.  
b) An 8km optical link consists of multimode step index fiber with a core refractive index of 1.45 and relative refractive index difference of 1.2%. Estimate: 1) The delay difference between the slowest and fastest modes at the fiber output 2) The rms pulse broadening due to intermodal dispersion.
- 4 Mention and explain different Splicing techniques.
- 5 a) Draw and explain the output patterns of source to fiber power launching.  
b) What is equilibrium numerical aperture?
- 6 Explain about Probability of error, Quantum limit and Analog receivers in optical fiber receiver.
- 7 a) Following are the parameters of a point-to-point optical link :

i) Optical power launched	: +2dBm
ii) Sensitivity of detector	: -22 dBm
iii) Source/detector connector loss	: 1 dB
iv) Length of optical cable	: 50 km
v) Cable attenuation	: 0.3 dB/km
vi) Jumper cable loss	: 2 dB
vii) Connector loss at each fiber joint	: 1 dB

(two at each transmitter and receiver end because of the jumper cables) Compute the power margin of the link using spread sheet method.

  
b) Derive an expression for the total system rise time budget in terms of transmitter fiber and receiver rise time.
- 8 a) What are the advantages and the necessity of WDM?  
b) Explain the principle of WDMs and explain different types of WDMs with suitable figures.