

Code: 9A04702

B.Tech IV Year I Semester (R09) Supplementary Examinations June 2016

OPTICAL COMMUNICATION

(Electronics & Communication Engineering)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

- 1 (a) Starting from Maxwell's equations, derive the expression for wave equation of an EM wave propagating through optical fibre.
(b) Calculate the numerical aperture of a step-index fibre having $n_1 = 1.48$ and $n_2 = 1.46$. What is the maximum entrance angle $\theta_{0\max}$ for this fibre if the outer medium is air with $n = 1$?
- 2 (a) Describe the single mode fiber and their mode field diameter. What are the propagations modes in them?
(b) Explain the process of plasma –activated chemical vapour deposition method.
- 3 (a) Describe the linear & non linear scattering losses in optical fibre.
(b) A continuous 12 km-long optical fiber link has a loss of 1.5 dB/km. What is the minimum optical power level that must be launched into the fiber to maintain optical power level of $0.3\mu\text{A}$ at the receiving end.
- 4 (a) Describe three types of misalignment that contribute to insertion loss at an optical fiber joint.
(b) Outline the major categories of multi port fiber optic coupler?
- 5 Draw and explain the structure of Fabry-Perot resonator cavity for a laser diode. Derive laser diode rate equations.
- 6 (a) What is meant by detector response time? Explain.
(b) Calculate the responsivity of a detector of with quantum efficiency of 10% at 800 nm.
(c) Explain the temperature effect on avalanche gain on ADD.
- 7 (a) Considering the probability distributions for received logic 0 and 1 signal pulses, derive the expressions for BER and error function.
(b) Calculate the model-dispersion limited transmission distance for a 100 Mb/s data link using SI and GRIN fibers with $n_1 = 1.45$ and $A = 1\%$. The coding is in RZ code format.
- 8 (a) Explain about 2X2 waveguide coupler.
(b) An optical transmission system is constrained to have 500 GHz channel spacing. How many wavelength channels can be utilized in the 1536-to-1556 nm spectral band?
