8E4090

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B. Tech. VIII Sem. (Main/Back) Exam., April, 2015
Electronics & Communication Engineering
8EC3 Optical Communication

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 24

Instructions to Candidates:

*Attempt any **five questions,** selecting **one question** from **each unit.** All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.

1. NIL 2. NIL

UNIT – I

Q.1 (i) Describe the techniques employed and the fiber structures utilized to provide- [10]

(a) Dispersion – shifted single mode fiber

(b) Dispersion – flattened single mode fiber

(ii) A multimode graded index fiber exhibits total pulse broadening of 0.1 μs over a distance of 15 km. Estimate- [6]

(a) The maximum possible bandwidth on the link assuming no inter-symbol interference.

(b) The pulse dispersion per unit length.

OR

Q.1 (a) Briefly explain the various factors contributing to dispersion. [6]

(b) Explain Material dispersion and Waveguide dispersion. [6]

(c) When the mean optical power launched into an 8 km length of fiber is 120μw, the mean optical power at the fiber output is 3μw. Determine - [4]

(i) Overall signal attenuation

(ii) The signal attenuation per kilometer for the fiber.

UNIT – II

Q.2 (a) Explain the quantum efficiency of LED and external quantum efficiency of Laser. [8]

(b) A double heterojunction in GaAsP LED emitting at a peak wavelength of 1310 nm has radiative and non-radiative recombination times of 30 and 100 ns, respectively. The drive current is 40 mA. Calculate - [8]

(i) Internal quantum efficiency

(ii) Optical power generated internally.

OR

Q.2 (a) Discuss the Buried – hetrostructure laser diodes for short wave length (GaAlAs) and long wave length (In GaAsP). [8]

(b) Write Laser diode rate equation. [8]

UNIT – III

Q.3 (a) A photo diode has a quantum efficiency of 65% when photons of energy 1.5×10^{-19} J are incident upon it. [8]

(i) At what wavelength is the photodiode operating?

(ii) Calculate the incident optical power required to obtain a photocurrent of 2.5μA when the photo diode is operating as above.

(b) Draw the block diagram of optical receiver and explain the fundamental concept of coherent light wave system. [8]

OR

Q.3 (a) Discuss the following in brief. [12]

(i) Detector response time

(ii) Avalanche multiplication noise.

(b) If the photodiode capacitance is 3PF, the amplifier capacitance is 4 PF, the load resistor is 1KΩ and the amplifier resistance is 1MΩ, find the circuit bandwidth.[4]

UNIT – IV

Q.4 (a) Draw the schematic diagram of a light source coupled to an optical fiber and calculate the maximum optical power coupled into fiber. [10]

(b) A GaAs optical source with a refractive index of 3.6 is coupled to a silica fiber that has a reflective index of 1.48. If the fiber end and the source are in close physical contact, calculate power loss 'L' in decibels. [6]

OR

Q.4 (a) Write some principal requirements of a good connector design and explain the different optical fiber connectors. [8]

(b) Explain the losses caused by longitudinal, lateral and angular displacement in splicing of fibers. [8]

UNIT – V

Q.5 Explain with a neat diagram-

(i) Time domain intermodal dispersion measurement technique [6]

(ii) Frequency domain intermodal dispersion measurement [5]

(iii) Chromatic dispersion measurement [5]

OR

Q.5 (a) Discuss the cut back technique of attenuation measurement with diagram. Also state the merits and demerits of it. [8]

(b) Briefly explain the measurement of numerical aperture of optical fibers. [8]
