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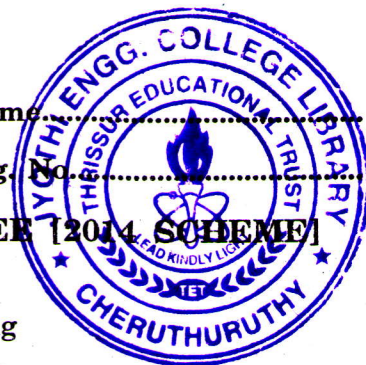
Name:

Reg. No.

**SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2014 SCHEME]
EXAMINATION, APRIL 2017**

Electronics and Communication Engineering

EC 14 602—OPTICAL COMMUNICATION



Time : Three Hours

Maximum : 100 Marks

Answer any eight questions.

1. (a) Explain the effect of dispersion in single mode fibers.
- (b) Consider a graded index fiber having a parabolic refractive index profile, 25 μm core radius, $n_1 = 1.48$ and $n_2 = 1.46$. If $\lambda = 1320$ nm, what is the value of V and how many modes propagate in the fiber? Compare this with the number of modes for a Step Index configuration.
- (c) Explain the occurrence of bending loss in optical fiber signal propagation.
- (d) Compare LED and Laser diode considering different parameters.
- (e) Discuss the modulation characteristics of Laser diode.
- (f) Explain the structure and characteristics of pin photodiode.
- (g) Explain the contribution of shot noise to the equalizer output noise voltage.
- (h) Outline the inter symbol interference and method of equalization to reduce it.
- (i) Explain the operation of Brillouin amplifier.
- (j) Explain the function of isolators, circulators and attenuators.

(8 \times 5 = 40 marks)

2. (a) (i) What is numerical aperture? Derive an expression for numerical aperture and acceptance angle in step index fiber in terms of refractive index of core and cladding.
- (ii) Explain the structure of single mode and multi mode optical fibers with cross section and ray path.

(10 marks)

Or

- (b) (i) Discuss the scheme for realizing dispersion shifted fibers.
- (ii) Explain the attenuation mechanism due to absorption in optical fibers.

(7 marks)

(8 marks)

Turn over

3. (a) Explain the principle of operation of a Laser diode and derive an expression for the lasing threshold current density.

Or

- (b) (i) A given avalanche photo diode has a quantum efficiency of 65% at wavelength of 900 nm. If $0.5 \mu\text{W}$ of optical power produces a multiplied photo current of $10 \mu\text{A}$. find the multiplication factor M .

(7 marks)

- (ii) Explain the structure of Light Emitting Diode with neat diagram.

(8 marks)

4. (a) (i) Derive the sensitivity of optical receivers.

(10 marks)

- (ii) Explain the term quantum limit.

(5 marks)

Or

- (b) (i) Explain the degradation induced by non-linear effects in fiber propagation.

(8 marks)

- (ii) Discuss the homodyne and heterodyne systems.

(7 marks)

5. (a) Explain the architecture and energy level diagram of Erbium-doped optical fiber amplifier. Also derive the power conversion efficiency and gain.

Or

- (b) (i) Draw and explain the structure and format of SONET/SDH frame.

(8 marks)

- (ii) Differentiate between WDM and DWDM optical systems.

(7 marks)

[4 × 15 = 60 marks]