C 22581 (Pages : 2) 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 λ = 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 × 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.

(5 marks)

(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.

(7 marks)

(ii) Explain the attenuation mechanism due to absorption in optical fibers.

(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 μW of optical power produces a multiplied photo current of 10 μA . 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]