http://www.rgpvonline.com

Total No. of Questions : 8] *[Total No. of Printed Pages : 3*

Roll No .....

EC-7003 (CBGS)

B.E. VII Semester

Examination, November 2019

Choice Based Grading System (CBGS)

Optical Communication

Time : Three Hours

Maximum Marks : 70

Note: i) Attempt any five questions.

ii) All questions carry equal marks.

iii) Make suitable assumptions wherever necessary.

1. a) Draw the block diagram of optical communication system and explain function of each block diagram.

   b) Describe with the aid of simple ray diagrams:

      i) Single mode step index fiber

      ii) Multimode step index fiber

      Compare the advantages and disadvantages of these two types of fiber for use as an optical channel.

2. a) Describe the advantage and disadvantages of optical fibre communication system over other terrestrial communication link.

   b) A silica optical fiber with a core diameter large enough to be considered by ray theory analysis has a core refractive index of 1.50 and a cladding refractive index of 1.47.

      Determine:

      i) Critical angle at the core-cladding interface

      ii) Numerical Aperture for the fiber

      iii) Acceptance angle in air for the fiber

http://www.rgpvonline.com

3. a) Describe with the aid of suitable diagrams the mechanism giving the emission of light from an LED. Discuss the effects of this mechanism on the properties of the LED in relation to its use as an optical source for communications.

   b) A planar LED is fabricated from gallium arsenide which has a refractive index of 3.6.

      i) Calculate the optical power emitted into air as a percentage of the internal optical power for the device when the transmission factor at the crystal-air interface is 0.68.

      ii) When the optical power generated internally is 50.

4. a) Discuss lens coupling of LEDs to optical fibers and outline the various techniques employed.

   b) Explain the detection process in the *p–n* photodiode. Compare this device with the *p–i–n* photodiode.

5. a) A silicon *p–i–n* photodiode has an intrinsic region with a width of 20 μm and a diameter of 500 μm in which the drift velocity of electrons is 10^5 ms^{-1}. When the permittivity of the device material is 10.5×10^{-13} F cm^{-1}, Calculate:

      i) the drift time of the carriers across the depletion region

      ii) the junction capacitance of the photodiode

   b) Outline the reasons for the adoption of the materials and devices used for photo-detection in optical fiber communications. Discuss the *p–i–n* photodiode with regard to performance and compatibility requirements in photo-detectors.

http://www.rgpvonline.com

http://www.rgpvonline.com

6. a) Explain the probability of error and quantum limit in an optical receiver.

   b) An analog optical fiber system operating at a wavelength of 1μm has a post-detection bandwidth of 5 MHz. Assuming an ideal detector and considering only quantum noise on the signal, calculate the incident optical power necessary to achieve an SNR of 50 dB at the receiver.

7. a) Explain the following requirements for the design of an optically amplified WDM link:
   i) Link bandwidth
   ii) Optical power requirements for a specific BER

   b) What is the significance of Excited State Absorption (ESA) in erbium-doped fiber amplifier? Explain Excited State Absorption (ESA) with the help of suitable diagram.

8. Write short notes on any three of the followings:
   i) Fiber Slicing
   ii) Scattering loss
   iii) Mode field diameter
   iv) Eye diagram test

114

******

http://www.rgpvonline.com
http://www.rgpvonline.com

http://www.rgpvonline.com