AQ – 2919

First Semester M. E. Full Time (Electronics and Telecommunication) Examination

ADVANCED OPTICAL COMMUNICATION

Paper - 1 ENTC 1

P. Pages : 3

Time : Three Hours] [Max. Marks : 80

Note : (1) Separate answer book must be used for each section in the subject Geology, Engineering, material of Civil Branch and Separate answer-book must be used for Section A & B in Pharmacy and Cosmetic Technology.
(2) All question carry marks as indicated.
(3) Answer **Three** question from Section A and **Three** question from Section B.
(4) Due credit will be given to neatness and adequate dimensions.
(5) Assume suitable data wherever necessary.
(6) Illustrate your answer wherever necessary with the help of near sketches.

SECTION A

1. (a) What are the different criteria considered for selection of fiber in designing of high-speed/ high bandwidth optical communication system? 7

   (b) What are the different losses in fibre cable? Discuss the various techniques to reduce these losses. 7

OR

2. (a) What do you mean by acceptance angle? Derive an expression for NA. How is it related to relative refractive index difference? 7

   (b) A step index fiber has a acceptance angle in air of 0.115 radians and a relative refractive index difference 0.9%. Estimate the speed of light in the fiber core. 7

3. (a) Explain the principle, construction and working of non-semiconductor injection LASER (Nd-YAG Laser) 7

   (b) What are the various characteristics of LED? Explain any two in detail. 6

OR

4. (a) State and explain threshold condition for LASER. 7

   (b) Explain the different techniques used to couple light source from LED into a fiber. 6

5. (a) What is the gain saturation in optical amplifier ? What is its importance? 7

   (b) Discuss in detail stimulated emission and spontaneous emission. 6

OR

6. (a) Explain the principle of operation of a repeater. 7

   (b) In an optical communication system, what is the need of an optical amplifier ? What are the advantages of an optical amplifiers over regenerators ? 6

SECTION B

7. (a) What do you understand by detector sensitivity ? How is it calculated? 7

   (b) A photodiode has a quantum efficiency of 65%, when photon of energy 1.5×10^{-19}J are incident upon it.

   (i) At what wavelength the photodiode is operating?

   (ii) Calculate the incident optical power required to obtain a photo current of 2.5 μA, when the photodiode is operating as described above. 7

OR

8. (a) Explain the principle of operation of optical isolator. 7

   (b) What is the importance of quantum limit in the design process of amplifier commu-nication system? 7

9. (a) Discuss various parameters for DWDM system deisgn. 7

(b) Describe in detail the design considerations of optical multiplex/demultiplex. 6

OR

10. (a) Write a detail about angular dispersive devices. 7

(b) Explain wideband DWDN network through any combination of ring or mesh network. 6

11. (a) Why numerical aperture is an important parameter of an optical fiber? Explain any one method for the measurement of numerical aperture. 7

(b) What are the various types of dispersion in optical fiber ? Discuss the method of measurement of any one type of dispersion. 6

OR

12. (a) The shadow method is used for the on-line measurement of the outer diameter of an optical fiber. The apparatus employs a rotating mirror with an angular velocity of 4 rad s^{-1} which is located 10 cm from the photodetedor. At a particular instant in time a shadow pulse of width 300 μs is registered by the photodetector. Determine the outer diameter of the optical fiber in μm at this instant of time. 7

(b) Explain in detail any one method for fiber refractive index profile measurement. 6