Registration No. :

Total number of printed pages – 2

Sixth Semester Regular Examination – 2015
OPTOELECTRONICS DEVICES AND INSTRUMENTATION
BRANCH (S) : AEIE, EEE, IEE

QUESTION CODE : J 460

Full Marks – 70

Time : 3 Hours

Answer Question No. *1* which is compulsory and any *five* from the rest.
The figures in the right-hand margin indicate marks.

1. Answer the following questions :   2 × 10

   (a) How does plane polarized light is produced from unpolarized light ?

   (b) Show schematically the distribution of intensity, due to diffraction in 3 slits experiment.

   (c) Calculate the diameter of the step index fiber core if the relative refractive index difference is 1%, core refractive index 1.5, Number of modes propagation 1100 and Wavelength of operation 1.3 μm.

   (d) Differentiate between a single mode and multimode fiber.

   (e) How numerical aperture is related to acceptance angle ?

   (f) Write any two differences between the radiation pattern of an edge emitting LED and surface emitting LED.

   (g) Find a relation between responsivity and quantum efficiency of a photo detector.

   (h) What is thermal Noise ? Write an expression for it.

   (i) Distinguish between an active and passive sensor.

   (j) What is OFDR ? How it is different from OTDR ?

2. (a) In interference show that : $I = I_1 + I_2 + 2\sqrt{I_1 I_2} \cos(wt + k.r - \delta)$, where the symbols have usual meaning.   5

(b) A graded index fiber with a parabolic index profile supports the propagation of 742 guided modes. The fiber has a numerical aperture in air of 0.3 and a core diameter of 70 μm. Determine the wavelength of the light propagating in the fiber. Further estimate the maximum diameter of the fiber which gives single mode operation at the same wavelength   5

3. (a) Discuss different reasons for attenuation in optical fiber.   5

   (b) A 6 km optical link consists of multimode SIN fiber with core refractive index of 1.5 and a relative refractive index difference of 1%. Estimate delay difference between slowest and fastest mode. Find maximum bit rate assuming only intermodal dispersion.   5

4. Distinguish between stimulated emission and spontaneous emission. What are the essential components of a laser device ? Explain the working principle of a semiconductor Laser. Draw the necessary energy band diagram.   10

5. (a) Draw the schematic diagram for a short wavelength LD using Double heterostructure configuration.   5

   (b) Explain with a suitable diagram to illustrate analog modulation using LED.   5

6. (a) Distinguish between PIN and APD.Expalin the working principle of PIN with a suitable diagram.   5

   (b) Which noises are important for photo detector? Find an expression for SNR in a PIN under shot noise limited condition.   5

7. (a) State Faradays effect. Explain the measurement of current using this effect using a suitable diagram.   5

   (b) What is distributed fiber optic sensor ? Explain how one can measure any physical quantity at different locations at the same time using this sensor ?   5

8. Explain how the following quantities can be measured using fiber optic sensor (any **two**) :   5×2
   (a) Displacement
   (b) Angular velocity
   (c) Flow
   (d) Voltage.