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Total number of printed pages – 2

B. Tech
PEEE 5301 (New)

Sixth Semester (Back) Examination – 2013

OPTOELECTRONICS DEVICES AND INSTRUMENTATION

BRANCH : AEIE, CSE, IT

QUESTION CODE : B305

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) What is the function of quarter wave plate ?
 - (b) What is snell law ? Explain with suitable diagram.
 - (c) Draw refractive index profile of step and graded index optical fiber.
 - (d) What is splicing ? Name any one splicing method with suitable diagram.
 - (e) What is APD ? Explain briefly.
 - (f) Name a polarized modulated fiber optic sensor. Explain briefly.
 - (g) What do you mean by distributed fiber optic sensor ? Give a example.
 - (h) Draw a Fabry-Perot resonator with proper labeling.
 - (i) Write two basic differences between single mode and multi mode fibers.
 - (j) What is total internal reflection? Explain.
2.
 - (a) Draw the ray propagation in a step-index optical fiber. Explain with suitable diagram. Derive for its numerical aperture. 5
 - (b) Derive the expression for multipath dispersion in step index fiber with suitable diagram. 5
3.
 - (a) Draw a DH LED. Explain its principle of operation and draw its energy band diagram. 5
 - (b) Explain He-Ne laser with suitable diagram. 5

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4. (a) Suggest and explain a fiber optic sensor which can be used for measurement of current in conductor. 5
- (b) Explain with suitable diagram of an intrinsic fiber optic sensor which is used for measurement of displacement. 5
5. (a) Explain different type of losses present in optical fiber. 5
- (b) Why coupler are used in optical fiber system ? Explain principle of coupler with suitable diagram. Mention different losses present in it. 5
- 6 (a) Explain the principle of operation PIN photodiode with suitable diagram. What is significance of 'I' in PIN diode. 5
- (b) Explain different phenomena when a packet of photons incident on a two level atomic system with suitable diagrams. 5
7. (a) Prove that in a phase modulated fiber optic sensor

$$(\Delta \varphi / \varphi) = (\Delta L / L) + (\Delta n / n)$$
Where φ is phase of light in fiber, L is length of fiber, n is refractive index of fiber. 5
- (b) A light of wavelength $0.633 \mu\text{m}$ is propagating through single mode silica based optical fiber. Assume that the measurand is temperature which changes the refractive index of silica at the rate of $10^{-5} \text{ }^\circ\text{C}^{-1}$. The nominal refractive index of the core is 1.46 and the fractional change in the length of the fiber per degree change in temperature is $5.5 \times 10^{-7} \text{ }^\circ\text{C}^{-1}$. Calculate the phase change per unit length per degree rise in temperature of the fiber. 5
8. Write short notes on any two of the following : 5×2
- (a) Polarization of light
- (b) Fiber optic gyroscope
- (c) Pulsed type laser
- (d) Splicers.

