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Total Number of Pages : 02

B.Tech.  
PEEE5301

**6<sup>th</sup> Semester Back Examination 2017-18**  
**OPTOELECTRONICS DEVICES AND INSTRUMENTATION**  
**BRANCH : IT**  
**Time : 3 Hours**  
**Max Marks : 70**  
**Q.CODE : C435**

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

- Q1 Answer the following questions : (2 x 10)**
- a) A silica optical fiber has a core refractive index of 1.50 and a cladding refractive index of 1.48. Find the critical angle at the core-cladding interface.
  - b) Define the mode-field diameter (MFD) in a single-mode fiber
  - c) How does guided mode vary with refractive indices of core and cladding?
  - d) Which color of light has the shortest wavelength?  
a) Yellow                      b) Blue                      c) Red                      d) Green
  - e) What is the material used for the fabrication of sources having operating wavelength in the range of 0.8-0.9 $\mu$ m?
  - f) What are optoelectronic modulators?
  - g) Enlist different type of acoustic-optic modulators.
  - h) What is the principle of LED?
  - i) Outline the advantages and drawback of APD as detector for optical fiber communication.
  - j) Find the responsivity of an ideal p-n photo diode at third optical communication window.
- Q2 a) Write different applications of step Index fiber and Graded Index fibers. (5)**  
**b) Enlist various advantages of optical fiber communication as compared to analog communication. (5)**
- Q3 a) What do you mean by normalized frequency of typical optical fiber? How is the normalized frequency (V) parameter is related to the radius of the core in optical fiber? (5)**  
**b) Explain material absorption for optical fiber with necessary mathematical expressions. (5)**
- Q4 a) Consider graded-index fibers having graded index profiles  $\alpha=2.0$ , cladding refractive indices  $n_2=1.478$ , wavelength  $\lambda=1550$  nm, radius of curvature R= 2.5 cm and index differences  $\Delta=0.01$ . Then compare the ratio of the effective number of modes to the total number of modes ( $M_{eff}/M_{\infty}$ ) when  $a=25\mu$ m and 50 $\mu$ m. (5)**  
**b) Explain the working principle of optoelectronic modulator. Enlist five advantages. (5)**
- Q5 a) Write the concept of absorption and emission of radiation of laser Diode with suitable diagrams. (5)**  
**b) A typical photodiode has a responsivity of 0.50  $A/W^{-1}$  for HE-Ne laser source. (5)**  
The active area of the photo diode is 2  $mm^2$ . Find the output current if the incident flux is 100  $\mu W/mm^2$ .

- Q6** a) Explain the structure of planar type LED with optical output power characteristics with neat diagrams. (5)  
b) What is Fiber optic gyroscope? Explain with neat sketch. (5)
- Q7** What do you understand from fiber splices? Explain various types of splices. (10)
- Q8** **Write short answer on any TWO :** (5 x 2)  
a) Rayleigh scattering losses  
b) SLED  
c) OFDR  
d) Bending Losses