

First Semester Regular/Back Exam 2015-16

FIBRE OPTICS COMPONENTS & DEVICES

BRANCH:ECE

Time: 3 Hours

Max marks: 70

Q.CODE:T1214

**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) Which window gives minimum attenuation in optical communication?
 - b) Differentiate between a direct band gap and indirect band gap semiconductor. Which semiconductor is used for LED?
 - c) Explain any two requirements of a fiber optic source
 - d) Distinguish between the emission from a surface emitting LED and edge emitting LED
 - e) Define Responsivity of a photo detector. How it is related to quantum efficiency
 - f) Mention the different types of splicing techniques
 - g) Distinguish between an isolator and Circulator. Draw necessary diagrams
 - h) Explain Von Neuman architecture of optical computer
 - i) A fiber Bragg Grating can be use as a filter. Explain.
 - j) What is optical bistability? Can this principle be used for optical switching?
- Q2** a) With suitable diagrams explain ,the analog and digital modulation in LED **(5)**
- b) Draw a schematic diagram for short wavelength LED mentioning the materials used in different layers .Explain how carrier confinement and optical confinement are realized in this structure. **(5)**
- Q3** a) What is stimulated emission? Explain the essential components of a laser Device **(5)**
- b) Explain the working principle of PIN Photo detector .How the sensitivity of detection can be improved using a APD? **(5)**
- Q4** Mention the noises which are important in photo detector. **(10)**
Find expressions for SNR In APD both in thermal noise and shot noise limited configuration
- Q5** a) A 80/125 μm GI fiber with a NA of 0.25 and α of 2 is joined with a 60/125 μm GI fiber with a NA of 0.21 and α of 1.9. The fiber axes are perfectly aligned and there is no air gap. Calculate the insertion loss at a joint for the signal transmission in the forward and backward **(5)**

directions.

- b) Mention three different lensing scheme using which the coupling efficiency between two fibers can be improved ,Draw necessary diagrams (5)
- Q6** a) Explain how electro optic effect can be used to modulate a light signal. (5)
b) Two similar Step index multimode fibers are joined with a small air gap. The fiber axes and end faces are perfectly aligned. If the refractive index of the core of the fiber is 1.59, calculate the joint loss (5)
- Q7** a) Write down the rate equation for semiconductor optical amplifier. Explain the origin of different terms clearly (5)
b) With the help of energy level diagram, explain the principle of amplification in EDFA. (5)
- Q8** Write short notes on any two: (5 x 2)
a) Optoelectronic Integration
b) Connector and splices
c) Raman Fiber Amplifier
d) WDM Couplers