Roll No. | | | | | | | | | | | | | **Total No. of Pages : 02**

Total No. of Questions : 09

B.Tech.(ECE) (Sem.–7,8)

OPTICAL FIBER COMMUNICATIONS

Subject Code : EC-404

Paper ID : [A0329]

Time : 3 Hrs. **Max. Marks : 60**

INSTRUCTION TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. Write briefly :

a) Discuss the concept of negative resistance in APD photo-detector.

b) Differentiate meridional and skew rays.

c) Using Ray theory describes the mechanism for the propagation of light in an optical fiber.

d) A graded index fiber has a parabolic refractive index profile with 45 μm diameter. The numerical aperture is 0.25. Find out the number of guided modes propagating when it is operating at 1.5 μm wavelength.

e) "*Nonlinearities are related with intensity*", Justify the statement.

f) Give details of optical cable construction.

g) Distinguish between RZ and NRZ modulation format.

h) Draw diagram and explain briefly distributed feedback laser.

i) Explain briefly fiber coupling losses.

j) How BER helps to determine receiver performance?

SECTION-B

2. What do you understand by FWHM? How does it apply to LED's characteristics?

3. The light output from GaAs is coupled into step index fiber with numerical aperture of 0.2, core refractive index of 1.4 and diameter larger than diameter of the device. Determine the coupling efficiency into the fiber and optical loss relative to the power emitted from the LED.

4. What do you understand by double hetero structure? Draw schematic diagram of an edge emitting DH LED.

5. A multimode step index fiber has a relative refractive index difference of 1 % and a core refractive index of 1.5. The number of modes propagating at a wavelength of 1.3 μm is 1100. Estimate the diameter of the fiber.

6. A glass clad fiber is made with core glass of refractive index 1.5 and cladding is doped to give a fractional index difference 0.0005. Calculate the cladding index and critical internal reflection angle.

SECTION-C

7. Fiber to fiber coupling losses is affected by intrinsic and extrinsic coupling losses. Can intrinsic coupling losses be limited by limiting fiber mismatches?

8. Outline common LED structure for optical fiber communications discussing their relative merits and drawbacks. In particular, compare surface and edge emitting devices.

9. a) Compare stimulated brillouin and stimulated scattering.

   b) The threshold optical powers for stimulated Brillouin and Raman scattering in a long 8 μm core diameter single mode fiber are found to be 190 mW and 1.70 mW respectively, when using an injection laser source with a bandwidth of 1GHz. Calculate the operating wavelength of the laser and the attenuation in decibels per kilometer of the fiber at this wavelength.