Registration No. : | | | | | | | | | | |

Total number of printed pages – 2

B. Tech

PEEC 4302

Fifth Semester (Back/Special) Examination – 2013

FIBER OPTICS AND OPTOELECTRONICS DEVICES

BRANCH : EC, ELECTRICAL, ETC

QUESTION CODE : D 327

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) Write any two merits of optical communication over electrical communication.
   (b) How numerical aperture of a fiber is related to acceptance angle ?
   (c) What is the unit of attenuation? How dBm is different from dB ?
   (d) Which dispersion is not present in single mode fiber ?
   (e) Explain mechanical splicing.
   (f) Mention any two important characteristics of Laser.
   (g) Differentiate between internal and external quantum efficiency of a source.
   (h) What is shot Noise ? Write an expression for it.
   (i) Distinguish between a directional coupler and circulator.
   (j) How is a solar cell different from a Photo detector ?
2. (a) What are the different modes that can propagate in a dielectric symmetric rectangular wave guide ? Explain in brief. 5
   (b) A symmetric step Index planar wave guide is made of glass with $n_1 = 1.5$ and $n_2 = 1.49$. The thickness of the guide layer is 9.83 μm and the guide is excited by a source of wavelength 0.85 μm. What is the range of propagation constants ? What is the number of modes supported by the guide ? 5

3. (a) A step index fiber has core refractive index 1.45. The relative index difference is 0.3%, core diameter 8.2 μm. Calculate wave guide dispersion for wavelength of 1.3 μm. 5

(b) What is bending loss in an optical fiber ? Distinguish clearly between micro bending and macro bending loss. 5

4. Write down the wave equation for an optical fiber in weekly guiding approximation. Solve this equation to show that field in the core is oscillatory and exponentially decaying in the cladding. 10

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

(b) What is population inversion ? Why is this an essential condition for laser action ? 5

6. (a) Explain the principle of operation of fiber amplifier ? Using a suitable energy diagram discuss the amplification mechanism in EDFA. 5

(b) Find an expression for gain in EDFA using the rate equations. Plot a graph for the variation of gain for a given pump power. 5

7. (a) State Acousto-optic effect. Explain how this effect can be utilized for modulation using a suitable diagram. 5

(b) What do you mean by Fill factor of a solar cell ? Explain the principle of operation of a homojunction solar cell. 5

8. Write short notes on any **two** of the following : 5×2

(a) Optical cavity

(b) SOA

(c) Double Crucible method

(d) Dispersion shifted fiber.