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**Question Paper Code : 51386**

B.E./B.Tech. DEGREE EXAMINATION, APRIL 2014.

Eighth Semester

Electronics and Communication Engineering

EC 2047/EC 803/EC 1011/10144 ECE 38 — OPTOELECTRONIC DEVICES

(Regulation 2008/2010)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Distinguish fresnel and fraunhofer diffractions.
2. What are the two basic methods of polarization?
3. What is meant by injection luminescence?
4. What is population inversion? What is it needed?
5. What are the properties of photo detectors?
6. What do you mean by response time of APD?
7. What is meant by photoelastic effect?
8. What is the director of LCD?
9. Compare between electronic and optonic ICS.
10. What is a planar waveguide?

PART B — (5 × 16 = 80 marks)

11. (a) (i) What are the different types of semiconductor materials? Justify how these semi-conductor materials are used as optoelectronic devices. (8)
- (ii) What is heterojunction? Explain its operation with sketches. Derive expression for injection efficiency. (8)

Or

- (b) (i) Explain in detail the radiative and non-radiative recombinations in direct bandgap and indirect bandgap semiconductors. Derive recombination efficiency. (8)
- (ii) Derive Einstein's relation for spontaneous and stimulated emissions and absorption. (8)
12. (a) (i) Classify luminescence according to the method of excitation. Explain every one of them in detail. (8)
- (ii) What is the need of optical feedback in Laser? Derive the threshold condition and gain. (8)

Or

- (b) (i) Describe the concept of producing high power short duration pulse from Laser. What are the various methods to accomplish this? Explain them. (8)
- (ii) Explain the working of DFB laser. What is a tunable Laser? (8)
13. (a) (i) Define photoconductive gain, responsivity and quantum efficiency of photodetector. Derive expressions for them. (12)
- (ii) An APD has quantum efficiency of 70% at wavelength  $1.3 \mu\text{m}$ . An output current of  $15 \mu\text{A}$  is produced by APD due to  $0.5 \mu\text{W}$  incident light power. Calculate the multiplication factor of the APD. (4)

Or

- (b) (i) Describe the working of thermal detector. (8)
- (ii) Derive expressions for the depletion layer photocurrent and response time of photo detector. (8)

14. (a) (i) Draw the Aconsto optic bragg diffraction waveguide modulator and explain. (8)
- (ii) Write a detailed note on switching and logic devices. (8)

Or

- (b) (i) Explain the analog and digital modulation techniques involved in the modulation of opto electronic devices and compare them. (8)
- (ii) What are the various types magneto optic devices? Explain the operation of Isolator. (8)
15. (a) Write notes on the following:
- (i) Monolithic integrated transmitter circuit. (8)
- (ii) Monolithic integrated receiver circuit. (8)

Or

- (b) (i) Describe the optoelectronic Integrated circuit switch using suitable diagram. (8)
- (ii) Explain the different types of strip waveguides in OEICs. (8)
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