Reg. No. | | | | | | | | | | | | |

Question Paper Code : 91388

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2014

Eighth Semester

Electronics and Communication Engineering

EC 2047/EC 803/EC 1011/10144 ECE 38 – OPTO ELECTRONIC DEVICES

(Regulation 2008/2010)

(Common to PTEC 2047 – Opto electronic Devices For B.E. (Part-Time) Seventh Semester ECE – Regulation 2009)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State "Malus's " Law.

2. At 300K, the Conductivity of intrinsic Silicon is $5 \times 10^{-4} \Omega^{-1} m^{-1}$. If the electron and hole mobilities are 0.14 and $0.05 m^2 V^{-1} s^{-1}$ respectively. What is the density of electron hole pairs?

3. Differentiate between characteristic and non characteristic energy level system in Phosphors.

4. Determine the Q of a laser cavity if its operating wavelength is $1 \mu m$ and the line width is 1 MHz.

5. Photon detectors operating above 3 μm wavelength must be cooled to 77 K - justify.

6. Define "Noise equivalent Power" of a photo detector.

7. What do you understand by "Ray velocity surfaces"?

8. List the processes that involve in optical detection in a MQW PIN diode.

9. How does Optical integration improves the performance of fiber Optic receivers?

10. Calculate the switching energy for a Mach Zender electro optic switch with $C = 1pF$ and $V_n = 1V$.

PART B — (5 × 16 = 80 marks)

11. (a) (i) From the first principles, show that the fringe spacing in a Young's slits experiment is given by $\delta Y = \lambda x / H$. If the aperture to the screen distance is 1.5 m and the wavelength is 632.8 nm what slit separation is required to give a fringe spacing of 1.2 mm? (8)

(ii) Explain the interference effects in thin films. (4)

(iii) Brief about Fraunhofer diffraction. (4)

Or

(b) Write a short note :

(i) Diffraction

(ii) Polarization

(iii) Interference

(iv) Various light sources

12. (a) (i) Illustrate the working of CRT screen. Also explain the principle of obtaining colour display in CRT, with relevant diagrams (10)

(ii) Outline the mechanism of electroluminescence emission involving avalanche process. (6)

Or

(b) (i) Discuss about the energy level diagram in the case of a hetrojunction lasers and explain the method of obtaining population inversion. (10)

(ii) Explain the construction and working of a stripe geometry laser diode. (6)

13. (a) (i) Explain the energy balance condition in a thermal detector element and obtain the expression for sensitivity. Also discuss the frequency dependence of detection in a Pyro electric detector. (12)

(ii) Brief about the noise performance of a Photo diode. (4)

Or

(b) (i) Derive the expression for frequency dependent responsively of a photo diode detector. (8)

(ii) Brief about the factors affecting the response time in photo diodes. (8)

14. (a) (i) Prove that the transmittance in the case of an electro optic modulator varies with applied voltage, with relevant equations. (10)

(ii) Explain the structure of a longitudinal electro optic cell with necessary diagram. (6)

Or

(b) (i) Explain the non linear phenomena in optical materials, which can be utilized for optical switching applications. (10)

(ii) Discuss the structure of bipolar controller - modulator for optical logic applications. (6)

15. (a) (i) Elaborate the various approaches for realizing Opto Electronic Integrated circuits. (8)

(ii) Discuss any two applications of opto electronic integrated circuits.(8)

Or

(b) (i) Enumerate with neat diagram, the construction and operation of an InP based front end photo receiver. (12)

(ii) Brief about the photo receiver Noise considerations. (4)
