Reg. No. : ☐☐☐☐☐☐☐☐☐☐☐☐

Question Paper Code : 21344

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2013.

Eighth Semester

Electronics and Communication Engineering

EC 2047/EC 803/EC 1011– OPTOELECTRONIC DEVICES

(Regulation 2008)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Differentiate between Diffraction and Scattering.

2. The average electric field in a particular 2.0 μm GaAs device is 5kV/cm. Calculate the average velocity of Electron, if its mobility value is 8000 cm²/V-s.

3. Why cathode luminescence is less efficiency than photo luminescence?

4. Find the Q-factor of a laser cavity oscillating at 650nm and having a line width of 1 MHz.

5. What are the advantages of photo conductive detector?

6. Calculate the photo current density in a 1 cm length silicon PIN detector, due to a photon flux of 4.37×10^{18}cm^{-2}s^{-1}. The absorption coefficient is 700 cm^{-1}.

7. Define Electro optic effect.

8. What is the principle of Quantum confined Stark effect (QCSE) based optical modulation?

9. What are the major differences in characteristic of Opto electronic IC's when compared to conventional electronic IC's?

10. Give the condition for complete power transfer from one guide to another in an optical waveguide directional coupler.

PART B — (5 × 16 = 80 marks)

11. (a) From the Schrödinger equation, explain the formation of energy bands in solids. (16)

    Or

    (b) Derive the expressions for concentration of electrons and holes in an intrinsic semiconductor, with relevant diagrams. (16)

12. (a) Explain with necessary diagrams the principle, construction and working of a liquid crystal display. (16)

    Or

    (b) Discuss the theory of population inversion and threshold condition in two level laser system. Also explain with diagram the various transitions involved in a four level system. (16)

13. (a) Compare the principle, construction and working of a thermal detector and a photo conductive detector. (16)

    Or

    (b) (i) Brief about the various noise sources in a photo multiplier tube. (8)

        (ii) With an equivalent circuit, explain the factors affecting the bandwidth of a PIN photo diode. (8)

14. (a) (i) Explain the concept of Birefringence in Uniaxial crystal with necessary diagrams. (8)

        (ii) Derive the expression for retardation between two waves due to applied voltage in electro optic material. (8)

    Or

    (b) (i) Discuss in detail the principle and operation of QCSE based optical switching device. (10)

        (ii) Expalin the significance for Multiple Quantum Wells in Opto electronic devices. (6)

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15. (a) (i) Explain any two applications of OEIC in detail. (12)

(ii) Write a note on Hybird integration OEIC fabrication. (4)

Or

(b) (i) Draw the diagram of a PIN diode and HBT integrated front end Photo receiver and explain its operation. (8)

(ii) Discuss the noise performance in Integrated Photo receivers. (8)

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