

**N 1136**

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2004.

Second Semester

Computer Science and Engineering

PH 136 — SEMI CONDUCTOR PHYSICS AND OPTO ELECTRONICS

(Common to Information Technology)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the momentum and energy operator in wave mechanical system in one dimension?
2. What is expansion of PIN photodiode? What is function of additional layer?
3. What is expansion of SQUID? What is the principle based on which does a SQUID function.
4. Give the principle of liquid crystal display (LCD).
5. What is Franz-Keldysh effect?
6. What is electro-optic retardation?
7. What is expression for skew ray numerical aperture?
8. What is quantum efficiency of the detector?
9. Give the principle of recording in a floppy disc.
10. How are magneto optic memory device fabricated?

11. (i) Derive an expression for density of states in an energy interval between  $E$  and  $E + \Delta E$
- (ii) Hence deduce an expression for Fermi energy  $E_F$ . (10 + 6)
12. (a) (i) Explain construction and working of shape memory alloys. (5 + 6)
- (ii) Suggest two applications of shape memory alloy. (6)

Or

- (b) What is Josephson's effect. Obtain an expression for frequency of an ac Josephson Junction explaining the generation of frequency. (3 + 10 + 3)
13. (a) (i) What is electro optic amplitude modulation? (3)
- (ii) Obtain an equation for Pockel electro optic modulator. (7)
- (iii) Calculate the voltage  $V_\pi$  for GaAs amplitude modulator when the wave length of light is  $1.1 \mu\text{m}$  and wave guide is  $1 \mu\text{m}$  thickness and  $1.5 \text{mm}$  long. ( $n_{ro} = 3.6$ ,  $r_i^p = 1.6 \times 10^{-12}$ ) (6)

Or

- (b) Give the circuit diagram of multiple quantum well hetero junction bipolar transistor (MQW – HBT). Describe the working of it as a Logic gate. Hence give the truth table. (3 + 7 + 6)
14. (a) (i) Describe two light sources used for optical fiber. (6)
- (ii) What is the method of joining two fibres? (10)

Or

- (b) (i) Discuss Electro optic phase modulation. (6)
- (ii) Deduce an expression for phase shift. (10)

5. (a) (i) What are the materials used for magnetic tape recording? (10)  
(ii) Write a note on bubble memory. (6)

Or

- (b) (i) Describe the principle used in compact disc optical storage device. (10)  
(ii) Write a note on charge coupled device. (6)