2017

M.Sc. 4th Semester Examination

ELECTRONICS

PAPER—ELC-403

Full Marks : 50

Time : 2 Hours

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

(Quantum Electronics)

Answer Q. No. *1* and any *three* from the rest.

1. (a) Amongst quantum dot and quantum wire lasers which one requires less threshold current and why ?

(b) What is GRIN-SCH ? State its advantages.

(c) Define quantum efficiency for photomultiplier tube.

(d) What are the drawbacks of homojunction semiconductor laser ?

(e) Mention the steps for producing MASER. 2×5

2. (a) What are degenerate and nondegenerate systems in quantum mechanics ?

(b) Using time independent perturbation theory derive the 1st order perturbation in energy.

(c) Find an expression for transition probability per unit time using time dependent perturbation theory.

(1+1)+3+5

3. (a) Discuss how solid state photomultiplication can be obtained in a superlattice APD.

(b) What are the advantages of SAM-APD over an ordinary APD ?

(c) Mention different noises present in APD. 5+3+2

4. (a) Show that the density of state function in two dimension is independent of energy.

(b) Discuss the MQW structure.

(c) Explain how a photomultiplier tube works.

$5+2\frac{1}{2}+2\frac{1}{2}$

5. (a) What do you mean by perturbation in quantum mechanical system.

(b) Derive the expression for Farmi's Golden Rule.

(c) Using time dependent perturbation theory explain the phonomena of absorption and emission. 1+6+3

6. (a) Discuss with neat energy band diagrams the mechanism of a heterojunction laser.

(b) Explain why microwave emission of stimulated type can be obtained more easily than laser emission.

(c) What are the advantages of NH_3 MASER ? 5+2+3

[Internal Assessment — 10 marks]

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