2016

M.Sc.

4th Semester Examination

ELECTRONICS

PAPER—ELC-403

Full Marks : 50

Time : 2 hours

The figures in the right-hand 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) Why should the direct bandgap semiconducting materials be used for developing opto-electronic devices generally ?

(b) What is a photo-multiplier ?

(c) Explain the necessity of narrow barriers in SL structures ?

(d) Explain why absolute monochromacity of an electromagnetic radiation is an unattainable goal.

(e) How can we increase α_e/α_n in an APD ? 2×5

2. (a) Using time-independent perturbation theory, obtain the first-order correction to wave-function and energy. State an example where the theory is employed.

(b) Discuss the necessity of intrinsic region in p-i-n photodiode. (3+3+2)+2

3. (a) Explain why MQW structures are important in two dimensional devices.

(b) Show that for a photo-diode working in photovoltaic mode, the output voltage is a logarithmic function of incident irradiance.

(c) Discuss the operation principle of MASER. 2+4+4

4. (a) Define density of states function.

   (b) Derive the expression for density of states as a function of energy for a bulk device.

   (c) Show graphically how it differs from that of a QW. Explain the cause of the nature of the graph for a QW.

2+4+(2+2)

5. (a) Distinguish between semi-conductor laser and gas-laser.

   (b) Explain the action of double heterojunction semiconductor.

   (c) What is GRIN SCH ? Draw its band diagram.

3+4+(2+1)

6. (a) Describe the working principle of a quantum well infrared photo detector.

   (b) With clear diagram explain the action of double heterojunction semiconductor. 5+5

Internal Assessment — 10
