

2007

ELECTRONICS**PAPER-IBC***Full Marks : 75**Time : 3 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.

Write the answers questions of each Group in separate books.

.Answer. Q. No. 1 and any three from the rest in each group.

Group , - .A

.(Marks : 40).

1. (a) Indicate IEEE microwave frequency bands.
- (b) Define the coupling factor & directivity of a directional coupler.
- (c) What is the significance of applegate diagram of a Klystron.
- (d) What is Magic tee ? Explain with suitable diagram.
- (e) What are the applications of microstrip and stripline circuits ?

2x5

(Turn Over)

2. (a) Deduce the S-matrix for Hybrid tees. 3+2
(b) Discuss different uses of Magic tees. Write a short note on rat-race circuit & derive its S-matrix. 5
3. With a neat sketch explain the operation of a Reflex Klystron & derive its bunching parameter. 10
4. (a) Discuss different kinds of physical structure of microwave transistor.
(b) What is Impact Ionization ? How negative resistance can be generated in an IMPATT diode? 4+2+4
5. (a) What is a slow-wave structure ? Why does the travelling wave tube need such a structure ? What is the major difference between TWT and Klystron?
(b) Draw a schematic diagram of a helix TWT and show that the output power gain of TWT is given by
$$G = 9.54 + 47.3 \text{ CN dB}$$
where the symbols have their usual significances. 5+5
6. Write short notes on (any two) 5x2
(a) NMOS fabrication.
(b) Isolator.
(c) Impatt diode.
(d) Microwave MESFET.

Group - B

(Marks : 35)

1. (a) Differentiate between the terms photo conduction & photo emission.
(b) Out of quantum dot and wire lasers, which requires less threshold current and why?
(c) What is the need for intrinsic region in the p-i-n photo. diode ?
(d) How speed of response of a photo multiplier limits its performances ?
(e) Why sensitivity, of a photo diode operated photo conductive mode is better than that of in photovoltaic mode? 5x1

2. Describe with band diagram how Laser oscillation can be obtained in a p-n junction. How we can get better optical confinement and lower threshold current by introducing hetero junction? What is SCH Laser? 5+4+1

3. Show that for a photo diode operated in photo voltaic mode output voltage is proportional with the logarithmic function of Incident Irradiance.
How does the performance of a photo diode change if we introduce an intrinsic region between p & n regions. 6+4

4. Discuss the different noises present in APD ? What is a SAM structure ? Briefly discuss the basic principle of solid state photo multiplier. 10

5. In case of time-independent perturbation theory determine the expression of 1st order energy shift $E_n^{(1)}$ and 1st order

change in n th energy eigenket $|n^{(1)}\rangle$.

10

6. Write short notes on (any two)

5x2

(a) MASER..

(b) Quantum Well Laser.

(c) APD.

(d) Fermi's Golden rule for transistor.