2019

PG

4th Semester Examination

PHYSICS

Paper - PHS 403

Full Marks : 40 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.

Group - A

Answer Q. No. 1 and any *two* from the rest. 2×2=4

1. Answer any *two* bits :

(i) Find the relation between Hall mobility and drift mobility in the low and high temperature region. What is Hall angle? 1½+½=2

(ii) Explain the I-V characteristics of a tunnel diode under reverse bias using the band diagrams? 2

[Turn Over]

(iii) If (n_l, v_l) and (n_u, v_u) are the electron densities and drift velocities in the lower and upper valley of GaAs band structure, find out an expression which relates electron temperature and lattice temperature. 2

3. Assuming Boltzman transport equation find an expression of thermoelectric power for couple 1 and 2 of nondegenerate semiconductions. 8

4. (a) Find an expression of channel conductance of FET when applied drain voltage is small.

   (b) What is SCR? 7+1

5. Explain how channel conduction is possible in MOSFET. Find an expression of saturated drain current. 2+6

Group - B

Answer Question number 1 and 2 and any *one* from the rest.

1. Answer any *two* of the following. 2×2=4

   (a) An optical fiber has core refractive index 1.55 and clad retractive index 1.54. Find its aperture angle.

(b) Write the importance of laser light in holographic recording.

(c) Write two advantages of optical logic gate over its electronic counter part.

2. Answer any *two* of the following. 3×2=6

(a) With supporting diagram draw the method of reconstruction of a wavefront from a recorded hologram.

(b) Show that the refractive index of a non linear material depends on the intensity of the incident light.

(c) A single optical fiber has core refractive index 1.54 and clad refractive index 1.53. Derive the maximum diameter of the fiber for the wave length 6000Å.

3. Answer any *one* of the following. 10×1=10

(a) Why a material becomes optically non-linear and what are the characteristics of a non-linear optical material? How these materials are used in material sciences?

Construct tri-state NOT gate.

Show how can you obtain all optical XOR and AND gate in practice. 2+1+2+2+3

(b) (i) Obtain the expression of TE symmetric waves in core and clad regions of optical planar wave guide. Hence derive the expression of a modal power in this wave guide.

(ii) An, optical planar wave guide has the V-parameter lying between 5π to 5.5π. Calculate the number of symmetric and antisymmetic modes. (5+3)+2=10