Exam.Code:0005
Sub. Code: 0449

2121

B.A./B.Sc. (General) Fifth Semester

Physics

Paper – B: Electronics and Solid State Devices – I

Time allowed: 3 Hours Max. Marks: 44

NOTE: *Attempt five questions in all, including Question No. 7 (Unit-III) which is compulsory and selecting two questions each from Unit I - II. Use of non- programmable calculator is allowed.*

x-x-x

Unit-I

1 (a) Discuss the various controls of a CRO and explain the display obtained on the screen when sinusoidal signal is applied to the vertical deflection plates. (6)

(b) State and explain Norton's theorem with example. (3)

2 (a) Obtain expression for static and dynamic resistance from diode equation and draw I-V characteritics p-n junction diode. (6)

(b) Find the concentration of atoms in germanium. Given atomic weight is 72.6 g/mole, $n_i = 2.5 \times 10^{13}$ g/cm^3 and density 5.32 g/cm^3. (3)

3 (a) Explain principle, construction and working of Photodiode. (6)

(b) Due to thermal excitation at a given temperature (300 K) the number of electrons and holes in a intrinsic sample of silicon = 1.5×10^{16} per meter^3. If doping this sample, $n_i = 2.5 \times 10^{12}$ per meter^3. Find the number of electrons in the doped sample. (3)

Unit-II

4 (a) Explain the working of Bridge rectifier and derive an expression for its ripple factor. (6)

(b) Design a full wave rectifier with LC filter at 50 Hz and have 3000 ohm load at d.c output of 300 V and ripple factor of 0.05. Find the value of LC. (3)

5 (a) What is the Early effect ? How does it effect the input and output characterises of a transistor in a CB mode ? Derive the relation $I_C = (\alpha/1-\alpha)\, I_B + (1/1-\alpha)\, I_{CBO}$ (6)

(b) In a common emitter circuit collector current = 0.95 mA and base current = 0.05 mA. Find the value of α. (3)

6 (a) Explain the base bias circuit with emitter feedback. Find its operating coordinates I_C and V_{CC}. (6)

(b) The current gain β of transistor is 76. The collector-base current is 15 nA when the emitter is open circuited. Find the leakage current from collector to emitter when base is open circuited (3)

P.T.O.

Unit-III

7 Attempt any eight questions.

(i) How is voltage source converted into a current source ?.
(ii) How Zener diode differ from ordinary diode ?
(iii) What is need of doping a pure semiconductor ?
(iv) Define diffusion capacitance of p-n junction ?
(v) Can we interchange emitter and collector of a transistor ?
(vi) Explain a good rectifier should have a low ripple factor.
(vii) what are clipping circuits ?
(viii) What do you mean by thermal runaway of a transistor ?
(ix) What is PIV of full wave rectifier ?
(x) How conductivity of a semiconductor affected with rise in temperature ?

$1 \times 8 = 8$

x-x-x