This question paper contains **3** printed pages]

S. No. of Question Paper : **855**

Unique Paper Code : **222504**   **G**

Name of the Paper : **Electronic Devices (PHHT 518)**

Name of the Course : **B.Sc. (Hons.) Physics**

Semester : **V**

Duration : **3 Hours**   Maximum Marks : **75**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Question No. **1** is compulsory.

Attempt *Five* questions in all.

1. Answer the following questions (any *five*) :

   (*a*) What is the position of the Fermi level in an intrinsic semiconductor ? How does its position change when :

   (*i*) donors and

   (*ii*) acceptors

   are added to the semiconductor ?   3

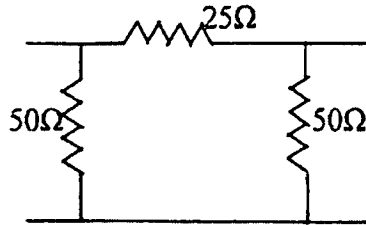   (*b*) Give *two* differences between BJT and FET.   3

   (*c*) A phase shift oscillator has three identical RC sections $R_L = R = 10$ kΩ and $C = 0.01$ μF. Determine the frequency of oscillation.   3

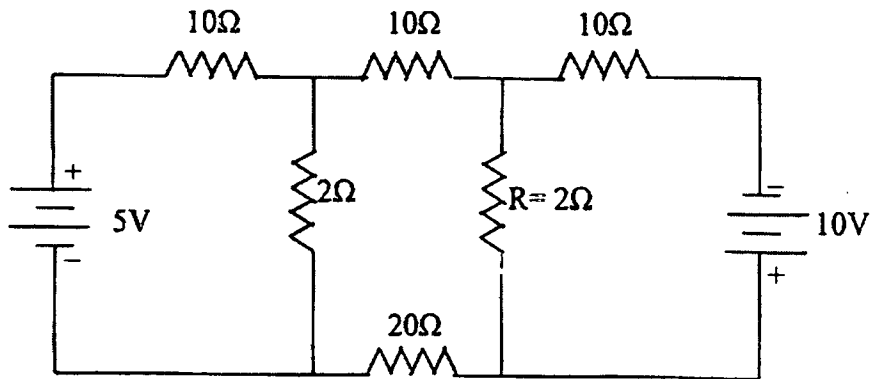P.T.O.

(d) Convert the following π to T network : 3

(e) Compare CE, CB and CC amplifiers in terms of current gain and voltage gain. 3

(f) For an abrupt p-n junction in Ge doped with donor and acceptor concentrations of $N_d = 10^{23}$ m^{-3} and $N_a = 10^{22}$ m^{-3}. Calculate the height of the potential barrier. 3

2. (a) Find voltage across R using mesh analysis. 7

(b) For an unbiased p-n junction, sketch the variation of the space charge, electric field and electric potential as a function of distance across the junction giving the relevant equations. 8

3. (a) For a four terminal network derive its T equivalent circuit in terms of short circuit and open circuit impedances. 7

(b) Explain the formation of depletion layer in a p-n junction diode. Derive the expressions for potential barrier and width of depletion layer for a p-n step junction diode. 8

4. (*a*) With the help of energy band diagram, explain current *Vs*. voltage characteristics of Tunnel diode in forward and reverse biasing conditions.   8

(*b*) Give advantages of LED over a conventional light bulb.   4

(*c*) The wavelength of light emitted by a certain LED is 60 nm. Find the energy gap in eV.   3

5. (*a*) What is negative feedback ? How does it affect the input and output impedance of an amplifier (support your answer with derivation) ?   8

(*b*) A transistor used in CE configuration has the following set of *h*-parameters : h_{ie} = 1 kΩ, h_{fe} = 100, h_{re} = 5 $\times$ 10^{-4} and h_{oe} = 2 $\times$ 10^{-5} S with R$_s$ = 2 kΩ and R$_c$ = 5 kΩ, determine input impedance, voltage gain, output impedance and current gain.   7

6. Draw the circuit diagram of a RC coupled amplifier. Draw the a.c. equivalent circuit at mid, low and high frequency respectively. Calculate the voltage gain in mid and low frequency regions.   15

7. (*a*) Explain the basic concept of amplitude, frequency, and phase modulation. Define modulation index and derive power relations between carrier wave and side bands in an Amplitude Modulated wave.   10

(*b*) Draw the circuit diagram of a diode detector for demodulation of AM wave and explain its working.   5