BRAINWARE UNIVERSITY

Term End Examination 2018 - 19

Programme – B.Tech. in Computer Science & Engineering

Course Name – Engineering Physics I

Course Code – PH101

(Semester – 1)

Time allotted: 3 Hours **Full Marks: 70**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group –A

(Multiple Choice Type Question) 10 x 1 = 10

1. *Choose the correct alternative from the following*

(i) Four capacitors each of 40 µF are connected in parallel, the equivalent capacitance of the system will be

a. 160 µF
b. 10 µF
c. 40 µF
d. 5 µF

(ii) When does the maximum power transfer take place from the source to the load?

a. When the source resistance is less than the load resistance
b. When there is negligible source resistance
c. When the source resistance is equal to the load resistance
d. When the source resistance is greater than the load resistance

(iii) The transformer turns ratio determines

a. the reflected impedance
b. the ratio of primary and secondary currents
c. the ratio of secondary and primary voltages
d. all of these

(iv) The power of AC circuit is maximum when the value of power factor is

a. $\sqrt{2}$ b. 1

c. 2 d. $\frac{1}{\sqrt{2}}$

(v) The Fermi level of n-type semiconductor lies

a. near the conduction band b. at the middle of the forbidden gap

c. near the valance band d. none of these

(vi) The intrinsic concentration of a semiconductor at 0 K is

a. zero b. infinity

c. 10^{19} m^{-3} d. none of these

(vii) When both the junctions of a transistor are reversed biased, the transistor operates in

a. saturation region b. cut-off region

c. active region d. none of these

(viii) Kirchhoff's voltage law is used for

a. loop analysis b. nodal analysis

c. finding out equivalent resistance d. none of these

(ix) Ripple factor of half wave rectifier is

a. 0.41 b. 1.21

c. 0.482 d. 1.11

(x) Barrier potential of Si diode is

a. 0.1 eV b. 0.7 eV

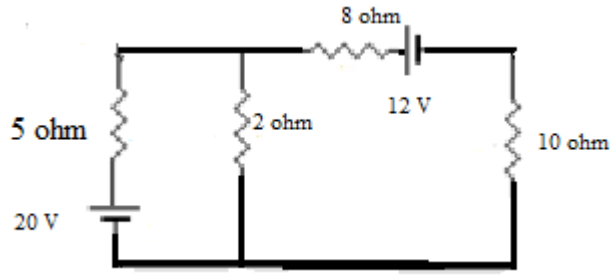
c. 0.3 eV d. 0.2 eV

Group – B

(Short Answer Type Questions) 3 x 5 = 15

Answer any *three* from the following

2. For the circuit shown in figure, calculate the current in the 10 ohm resistance. Use Thevenin's theorem.



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3. 27 spherical drops, each of same size, are charged at 220 V each. They coalesce to form a bigger spherical drop. Calculate the potential of the bigger drop. 5

4. (a) Find out the relation between α and β for a transistor, where notations have their usually meanings.

   (b) Find α and I_C of a transistor with β =49 and I_E =12 mA. 3+2

5. Distinguish between avalanche breakdown and Zener breakdown. 5

6. With the help of the energy band diagram, differentiate between metal, insulator and semiconductor. 5

Group – C

(Long Answer Type Questions) 3 x 15 = 45

Answer any *three* from the following

7. (a) Show that when a charged capacitor is allowed to discharge through a resistor, the decay of charge is exponential.

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   (b) What is the time constant? Draw q vs t graph for two time constants λ_2 and λ_1 when $\lambda_2 > \lambda_1$. What is the unit of time constant.

5

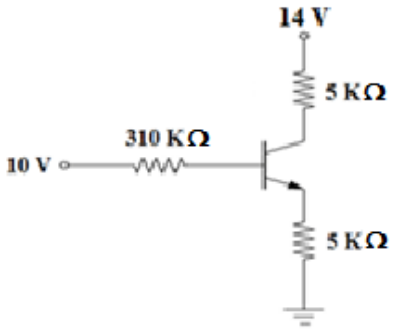
   (c) When a charged capacitor of 2μF is discharged through a resistance, it losses 50% of the charge in 5 min. Find the unknown resistance. Neglect natural leakage. 5

8. (a) Derive an expression for conductivity of a semi-conductor in terms of carrier concentration. 5

(b) At 300K the intrinsic concentration of silicon is 1.5×10^{16} m^{-3}. If the electron and the hole mobilities are 0.13 $m^2/(Vs)$ and 0.05 $m^2/(Vs)$ respectively, determine the intrinsic conductivity and resistivity of silicon at 300K. 5

(c) Draw the circuit diagram of a full wave rectifier using p-n junction diodes and explain its action. 5

9. (a) The CE configuration of an n-p-n transistor is shown in the figure where V_{BE} = 0.6 V and β = 125. If the emitter current is 1 mA, then find out the base current and V_{CE}.



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(b) Draw the circuit diagram of self-biased n-p-n transistor. 2

(c) Derive the stability factors of this circuit. Hence discuss the choice of relevant parameters for stability. 5+3

10. (a) What is quality factor (Q) for an a.c circuit**?** Prove that in case of series LCR circuit, the quality factor (Q) is given by $Q = \frac{1}{R}\sqrt{\frac{L}{C}}$ 2+3

(b) Illustrate wattless current in ac circuit. What is its importance? 4+1

(c) An alternating emf of 14 volt (r.m.s) is applied to a circuit containing an inductance of 0.2025 H, a capacitance of 50 μF and a resistance of 0.2Ω connected in series. Determine i) the resonant frequency ii) the potential difference across the inductance and iii) the Q-factor. 2+2+1

11. (a) Why n-p-n and p-n-p transistors are called bipolar transistors? 2

(b) Discuss the input and output characteristics of pnp transistor in CB configuration. What is early effect? 6+2

(c) A transistor amplifier in CE configuration couples a source of internal resistance 1 KΩ to a load of 20 KΩ. Find the current gain, input and output resistances if h_{ie}= 1KΩ, h_{re}=2.5 × 10^{-4}, h_{fe} = 150, 1/h_{oe} = 40KΩ. 5
