



BRAINWARE UNIVERSITY

Course – B. Tech. (CS)

Engineering Physics I (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 Questions)

10 x 1 = 10

1. Choose the correct alternative from the following

(i) If $\alpha = 0.98$, then β is

- | | |
|---------|--------|
| a. 0.49 | b. 49 |
| c. 50 | d. 0.5 |

(ii) L, C and R represent inductance, capacitance and resistance respectively. Which one of the following combinations has not the dimension of frequency?

- | | |
|-------------------|--------------------------|
| a. $\frac{1}{RC}$ | b. $\frac{L}{RC}$ |
| c. $\frac{C}{RL}$ | d. $\frac{1}{\sqrt{LC}}$ |

(iii) The value of α of transistor is

- | | |
|-------------------|------------------|
| a. greater than 1 | b. less than 1 |
| c. equal to 1 | d. none of these |

(iv) Band gap of Germanium is

- | | |
|------------|-----------|
| a. 0.54 eV | b. 1.1 eV |
| c. 0.72 eV | d. 1.2 eV |

(v) With the increase of temperature, reverse saturation current

- | | |
|-----------------|------------------|
| a. increases | b. decreases |
| c. remains same | d. none of these |

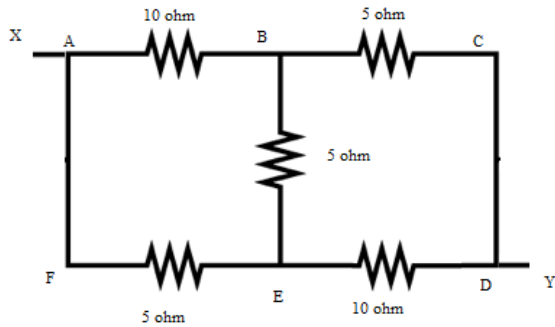
- (vi) The color code for the resistance $10\text{ K}\Omega$ is
- | | |
|----------------------|-----------------------|
| a. Brown Black Red | b. Brown Black Orange |
| c. Brown Black Brown | d. Brown Black Yellow |
- (vii) Bipolar junction transistor is a
- | | |
|------------------------------|------------------------------|
| a. voltage controlled device | b. current controlled device |
| c. power controlled device | d. none of these |
- (viii) Energy stored in a capacitor is
- | | |
|-----------------------|-----------------------|
| a. $\frac{1}{2} CV$ | b. $\frac{1}{2} QV^2$ |
| c. $\frac{1}{2} CV^2$ | d. CV |
- (ix) Transformer
- | | |
|--|--|
| a. Steps up or down a.c Voltages & Current | b. Steps up or down d.c Voltages & Current |
| c. Changes d.c to a.c | d. Changes a.c to d.c |
- (x) Which among the following is regarded as 'Dual of Thevenin's Theorem'
- | | |
|-----------------------------------|--------------------------|
| a. Norton's Theorem | b. Superposition Theorem |
| c. Maximum Power Transfer Theorem | d. none of these |

Group – B

(Short Answer Type Questions)
(Answer any *three* from the following)

- | | |
|---|------------|
| | 3 x 5 = 15 |
| 2. What are step up and step down transformers? What are the sources of losses in transformer? | [2+3] |
| 3. Write a short note on Zener diode. | [5] |
| 4. What is ripple factor? Evaluate the ripple factor of half wave rectifier. | [1+4] |
| 5. The reverse saturation current of a n-p-n transistor operating in CB configuration is $10\mu\text{A}$. For an emitter current of 2.4mA , the collector current is 2.26mA . Calculate the current gain and base current. | [5] |

6. Find the equivalent resistance between the points X and Y of the network of resistances.



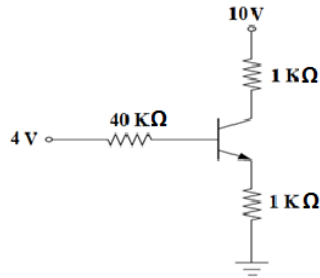
[5]

Group – C

(Long Answer Type Questions)
(Answer any *three* from the following)

7. (a) Explain drift and diffusion current in a semiconductor. 3 x 15 = 45
[5]
- (b) Explain I-V characteristic of a p-n junction diode with diode equation.
What is reverse saturation current? [5]
- (c) The reverse saturation current at 300K of a p-n junction diode is 5 μ A.
Find the voltage to be applied across the junction to obtain a forward current of 50mA. [5]
8. (a) Why 220 V a.c is more dangerous than 220 V d.c? [3]
- (b) Write down units of i) CR & ii) $\frac{L}{R}$ [1+1]
- (c) Derive the current voltage relationship in a circuit containing inductance and resistance in series and the circuit is being fed by a.c source. [5]
- (d) An a.c voltage 200volt, 50Hz is supplied to an inductive coil. A current of 10A flows in the circuit and the current lags behind the voltage by 30° . Calculate resistance, reactance and the value of inductance. [5]
9. (a) Illustrate stability factors related to transistor. [3]
- (b) Draw the circuit diagram of fixed-biased n-p-n transistor and derive the expressions for stability factors for this configuration. [2+5]

- (c) The CE configuration of an n-p-n transistor is shown in the figure where $V_{BE} = 0.7 \text{ V}$ and $V_{CE} = 0.2 \text{ V}$. If the emitter current is 3 mA , find out the collector current and the base current.



[5]

10. (a) Draw and label the circuit diagram of a small signal single stage low frequency transistor amplifier in the CE mode. Using the h-parameters, derive the expression for current gain, input resistance, voltage gain and output resistance. [2+8]
- (b) A CE amplifier uses a transistor with $h_{ie} = 1 \text{ K}\Omega$, $h_{fe} = 100$, $h_{re} = 2.5 \times 10^{-4}$, $h_{oe} = 25 \times 10^{-6} \text{ }\Omega^{-1}$. The load resistance is $5 \text{ K}\Omega$. Find the current amplification and overall voltage gain for a source resistance of $1 \text{ K}\Omega$. [5]
11. (a) Explain the term resonance as applied to electrical circuits. Find the condition for sharp resonance in case of series L-C-R circuit. In series L-C-R circuit at resonance, potential difference across which of L, C and R equals the applied emf? Justify. [2+5+2]
- (b) An alternating voltage 100 V , 1000 Hz is applied to series combination of a $100 \text{ }\Omega$ resistor and $10 \text{ }\mu\text{F}$ capacitor. Calculate circuit current, potential difference across the capacitor and potential difference across the resistor. [6]