Code : 031101

B.Tech 1st Semester Exam., 2018 (Old)

BASIC ELECTRICAL ENGINEERING

Time : 3 hours *Full Marks* : 70

Instructions :

(i) The marks are indicated in the right-hand margin.

*(ii) There are **NINE** questions in this paper.*

*(iii) Attempt **FIVE** questions in all.*

*(iv) Question No. **1** is compulsory.*

1. Attempt any *seven* short answer-type questions : 2×7=14

(a) Draw the *V-I* characteristics of ideal and practical current source and voltage source.

(b) State the maximum power transfer theorem.

(c) A sinusoidal voltage of 50 Hz has a maximum value of $200\sqrt{2}$ volts. At what time measured from a positive maximum value will the instantaneous voltage be 141·4 volts?

(d) What are the advantages of three-phase system?

(e) In two-wattmeter method, what will be the power factor when both wattmeters show equal readings?

(f) Explain magnetic leakage and fringing.

(g) How do the hysteresis and eddy current loss depend on frequency?

(h) Define form factor and peak factor.

(i) Write the statement of KVL and KCL.

(j) What is the meaning of phase sequence? How can it be changed?

2. *(a)* A series *R-L-C* circuit having a resistance of 50 Ω, an inductance of 500 mH and a capacitance of 400 μF, is energized from a 50 Hz, 230 V, AC supply. Find the—

(i) resonant frequency of the circuit;

(ii) peak current drawn by the circuit at 50 Hz;

(iii) peak current drawn by the circuit at resonant frequency. 6

(b) A coil of p.f. 0·8 is connected in series with a 110 μF capacitor. The supply frequency is 50 Hz. The potential drop across the coil is found to be equal to the potential drop across the capacitor. Calculate the resistance and inductance of the coil. 8

3. *(a)* Show that the average power demand, in purely inductive and purely capacitive AC circuit is zero. 6

(b) In a 3-phase circuit, two wattmeters used to measure power indicate 1000 W and 500 W respectively. Find the power factor of the circuit—

(i) when both wattmeter readings are positive;

(ii) when the latter reading is obtained by reversing the current coil connections. 8

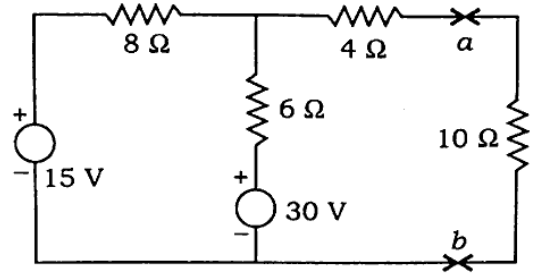
4. *(a)* Explain the various losses in a transformer. In which part these losses occur? How to minimize them? On which factors they depend? 6

(b) Explain the construction and working of a single-phase dynamometer-type wattmeter. https://www.akubihar.com 8

5. Compare electric and magnetic circuits, clearly stating similarities and dissimilarities between them. State five applications of magnetic circuit in engineering field. 14

6. Derive the relationship between line voltage and phase voltage, line current and phase current for a 3-phase delta-connected system. 14

7. Determine current in 10 ohm resistance using Norton's theorem in the network as shown in the figure below : 14



8. An iron ring of cross-sectional area 6 cm^2 is wound with a wire of 100 turns and has a cut of 2 mm. Calculate the magnetizing current required to produce a flux of 0·1 mWb if mean length of magnetic path is 30 cm and relative permeability of iron is 470. 14

9. *(a)* Derive the expressions of equivalent star network resistances from the delta network comprising of R_{12}, R_{23}, R_{31}, where nodes are termed as 1, 2, 3 respectively. 7

(b) Draw B-H curve with neat and labelled diagram. Explain its applicability in transformer. 7

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