

**B.Tech 1st Semester Exam., 2019
(New Course)**

BASIC ELECTRICAL ENGINEERING

Time : 3 hours

Full Marks : 70

Instructions :

- (i) The marks are indicated in the right-hand margin.
- (ii) There are **EIGHT** questions in this paper.
- (iii) Attempt **FIVE** questions in all.
- (iv) Question No. 1 is compulsory.

1. Answer the following short answer-type questions (any seven) : 2×7=14

- (a) Define active and passive element.
- (b) State and explain Norton theorem.
- (c) A half-cycle average voltage of 12 V is equal to what r.m.s. voltage?
- (d) What are the phase voltage and phase current of three-phase delta-connected system?
- (e) Draw equivalent circuit of a DC motor.
- (f) What is resonance?

- (g) Relate flux, reluctance and permeability.
- (h) Define power factor.
- (i) Write the application of Ohm's law.
- (j) Describe important characteristic of an inductor. <http://www.akubihar.com>

2. (a) Define Q-factor. What is the Q (quality factor) of a series circuit that resonates at 6 kHz, has equal reactance of 4 kilo-ohms each and a resistor value of 50 ohms? 6

(b) A series R-L-C circuit containing a resistance of 10 Ω, an inductance of 0.45 H and a capacitor of 400 μF is connected in series across a 120 V, 50 Hz supply. Calculate the total circuit impedance, the circuit current, power factor and draw the voltage phasor diagram. 8

3. (a) Find the resistor value R_1 in the Fig. 1 shown below : 6

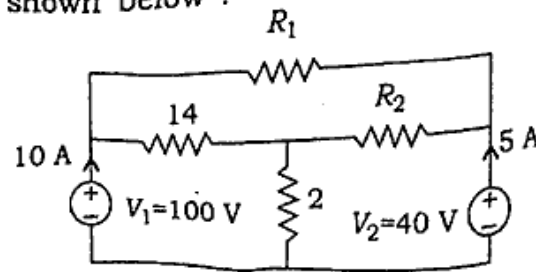


Fig. 1

(b) In a balance 3-phase 400 V circuit, $I_1 = 115.4$ A. When power is measured by two-wattmeter method, one meter reads 40 kW and other zero. What is the power factor of load? If unity power factor and line current are same, what would be the reading of each wattmeter? 8

4. (a) What are the two general types of transformer? Why is the low-voltage winding placed near the core? What will be the output of transformer if it is operated on DC supply? 6

(b) Describe the operation of a single-phase transformer, explaining clearly the function of different parts. Why are the cores laminated? 8

5. Draw and explain the $B-H$ curves for air and a magnetic material. What are different types of magnetic losses? How can they be minimized? 14

6. What is circuit? What is the difference between fuse and circuit breaker? Explain the objective of earthing. 14

7. Write Thevenin theorem statement. Determine the equivalent Thevenin's circuit between terminals a and b in the circuit shown in Fig. 2 below. Resistances are in ohms : 14

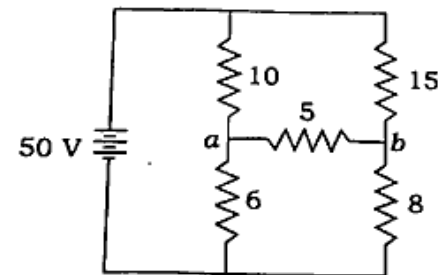


Fig. 2

8. Describe with neat sketches the construction of a 3-phase induction motor. Explain the principle of operation of a 3-phase induction motor. What is meant by slip in an induction motor? 14

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