

Total No. of Questions—8]

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**[5667]-1007**

**F.E. (All Branches) (I Sem.) EXAMINATION, 2019**

**BASIC ELECTRICAL ENGINEERING**

**(2019 PATTERN)**

**Time : 2½ Hours**

**Maximum Marks : 70**

**N.B. :—** (i) Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6 and Q. 7 or Q. 8.

(ii) Neat diagram must be drawn wherever necessary.

(iii) Figures to the right indicate full marks.

(iv) Use of Non-Programmable Scientific Calculators is allowed.

(v) Assume suitable data, if necessary.

1. (a) Define active, reactive and apparent power. State their units. Also draw the power triangle for R-L circuit. [4]
- (b) What is series resonance ? Derive the expression for resonant frequency. [6]
- (c) The R-L circuit when supplied by 180V, 50 Hz ac voltage, the voltage drop across the inductance is 150 V. The current drawn by the circuit is 5 A. Calculate : [8]
- (i) inductive reactance
  - (ii) inductance
  - (iii) resistance
  - (iv)  $V_R$
  - (v) P.F.
  - (vi) Phasor diagram.

P.T.O.

Or

2. (a) Obtain the expression for current, when voltage  $v = V_m \sin \omega t$  is applied across purely inductive circuit. [4]
- (b) Derive the expression for power, when voltage  $v = V_m \sin \omega t$  is applied across R-L series circuit. Draw the phasor diagram. [6]
- (c) The ac voltage given by  $v = 141.4 \sin (100 \pi t + \pi/3)$  Volt, when applied to certain circuit, resultant current is  $i = 7.07 \sin (100 \pi t + \pi/6)$  Amp. Draw the phasor diagram and Find : [8]
- (i) impedance
  - (ii) circuit elements
  - (iii) active, reactive and apparent power.
3. (a) Define : [3]
- (i) phase sequence
  - (ii) balanced and unbalanced load.
- (b) Derive the emf equation of 1-phase transformer. [6]
- (c) Three identical impedances each of  $8 + j6 \Omega$  are connected in star across 3-ph, 415 V, 50 Hz ac supply. Calculate : [8]
- (i) line voltage, phase voltage
  - (ii) phase current, line current
  - (iii) active power
  - (iv) When same impedances are connected in delta across the same supply voltage, find active power.

Or

4. (a) Why are steel laminations used for construction of transformer core ? Sketch different types of laminations used for core. [3]
- (b) What are losses taking place in the transformer ? State the parts in which they take place. How to minimize these losses ? [6]
- (c) Obtain the relation between phase values and line values of voltage and current in case of balanced star connected 3-ph inductive load. Assume phase sequence RYB. Draw the necessary phasor diagram. [8]

5. (a) Define the ideal and practical voltage sources. Draw their V-I characteristics. [4]
- (b) Find current flowing through AB using Kirchhoff's loop analysis for the circuit shown in Fig. 5(b). All resistances are in  $\Omega$ . [6]

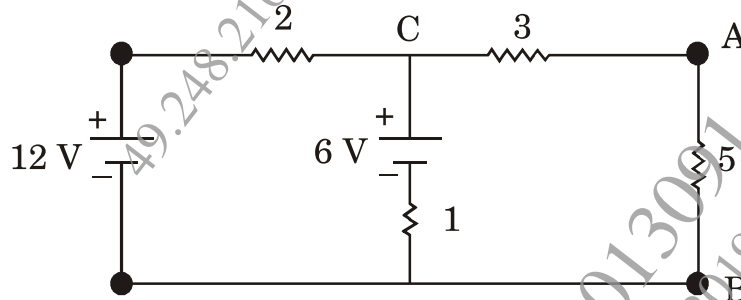


Fig. 5(b)

- (c) Derive the equations to convert Delta connected resistive circuit into equivalent star circuit. [8]

Or

6. (a) State and explain KCL & KVL. [4]  
(b) Define :  
(i) active & passive network  
(ii) linear & nonlinear network.  
(iii) unilateral & bilateral network. [6]  
(c) Find current flowing through  $3\ \Omega$  using Superposition theorem for the circuit shown in Q 5(b) Fig. 5(b). [8]
7. (a) Define temperature coefficient of resistance. State the factors on which it depends. [3]  
(b) Compare lead acid battery and lithium ion battery. (6 points only). [6]  
(c) The electrical load of a bungalow is as follows. Find :  
(i) daily energy consumption in kWh.  
(ii) monthly electricity bill for the month of 30 days at the rate of Rs 6/unit.
- |                       |       |      |        |      |            |
|-----------------------|-------|------|--------|------|------------|
| (I) Tubes             | 40 W  | ---- | 06 nos | ---- | 6 hrs/day  |
| (II) Fans             | 60 W  | ---- | 04 nos | ---- | 10 hrs/day |
| (III) Washing machine | 2 kW  | ---- | 01 no  | ---- | 01 hr/day  |
| (IV) Geyser           | 2 kW  | ---- | 01 no  | ---- | 02 hrs/day |
| (V) TV                | 100 W | ---- | 01 no  | ---- | 06 hrs/day |
- [8]

Or

8. (a) State the applications of lead acid battery. [3]  
(b) Prove that  $\alpha_2 = \alpha_1/1 + \alpha_1 (t_2 - t_1)$ , all the symbols have their appropriate meaning. [6]  
(c) Explain the operation of Lithium ion battery with construction & chemical reactions during charging and discharging. Also state its applications. [8]