

Total No. of Questions—8]

[Total No. of Printed Pages—4

Seat No.	
-------------	--

**[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]

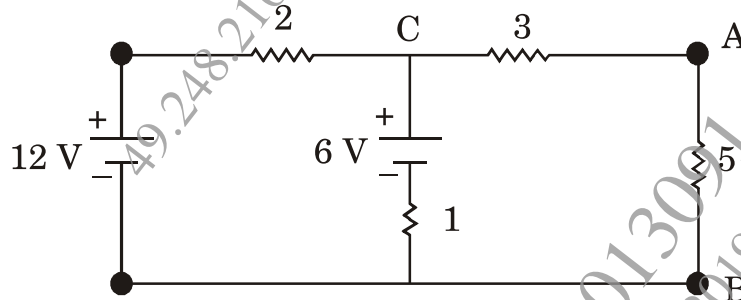


Fig. 5(b)

- (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]

Total No. of Questions : 8]

SEAT No. :

P6489

[Total No. of Pages : 4

[5868]-105

F.E. (All Branches)

**103004 : BASIC ELECTRICAL ENGINEERING**  
**(2019 Pattern) (Semester - I/II)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Assume suitable additional data, if necessary.
- 5) Use of non-programmable calculator is allowed.

**Q1)** a) Define and state the unit of admittance, conductance & susceptance. Also draw the admittance triangle for inductive circuit. [4]

b) Obtain the expression for current and power, when voltage  $v = V_m \sin \omega t$  is applied across purely resistive circuit. Also draw the waveform for voltage, current & power on common X-axis. [6]

c) The series circuit having resistance  $5 \Omega$ , inductance  $0.1 \text{ H}$  and capacitance  $150 \mu\text{F}$  is connected to 1-phase,  $200 \text{ V}$ ,  $50 \text{ Hz}$  AC supply. Calculate- [8]

- |                                 |                                |
|---------------------------------|--------------------------------|
| i) Inductive reactance $X_L$    | ii) Capacitive reactance $X_C$ |
| iii) Net reactance $X$          | iv) Impedance $Z$              |
| v) Current drawn by the circuit | vi) Power factor               |
| vii) Active power $P$           | viii) Reactive power $Q$       |

OR

**Q2)** a) Define and state the unit of active, reactive and apparent power in case of single phase circuit. Draw the power triangle. [4]

b) Derive the expression for resonant frequency and comment on impedance, current and power factor in case of series resonance circuit. [6]

c) Derive the expression for power, when voltage  $v = V_m \sin \omega t$  is applied across R-L series circuit. Also draw the waveform for voltage, current & power on common X-axis. [8]

P.T.O.

- Q3)** a) What is phase sequence? State it's any two applications. [3]
- b) State the relation between : [6]
- Phase voltage and line voltage
  - Phase current and line current in case of balanced delta connected 3-ph load. Using above relations, obtain the expressions for 3-ph active power and 3-ph reactive power.
- c) A 80 kVA, 1000/250 V, 1-ph 50 Hz transformer has iron loss of 1000 W and copper loss 400 W, when its primary draws current of 50A. Calculate [8]
- Efficiency at full load and power factor = 0.8 lag.
  - Efficiency at half load and power factor = 1 lag.
- OR**
- Q4)** a) What are the losses in the transformer? State the parts in which they take place. [3]
- b) Derive the EMF equation of single phase transformer. [6]
- c) Three identical impedances each of  $6+j8 \Omega$  are connected in star across 3-ph, 415 V, 50 Hz ac supply. Determine [8]
- Line voltage
  - Phase voltage
  - Phase current and line current
  - 3-ph active, reactive and apparent power
- Q5)** a) Define the practical voltage source & explain it by means of [4]
- Symbol of representation
  - Value of internal resistance
  - Graphs between V and I
- b) Derive the equations to convert Delta connected resistive circuit into equivalent Star circuit. [6]

- c) For the circuit given in fig 5c, write down the steps to find current through PQ using Superposition Theorem. [8]

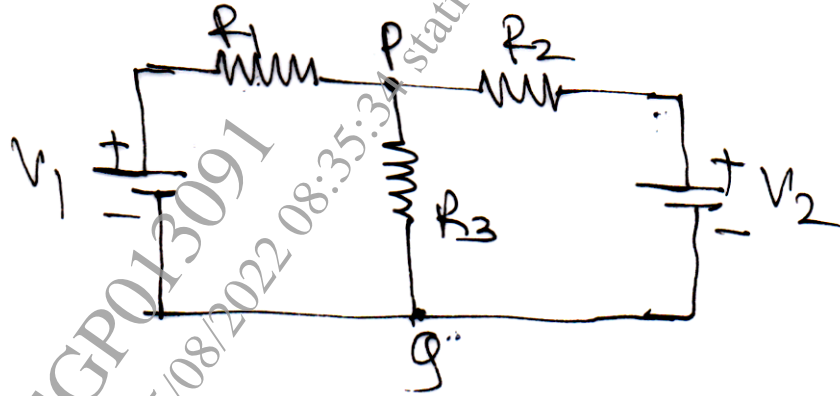


Figure 5c

OR

- Q6) a) State and explain KCL & KVL [4]  
 b) Calculate the current flowing through  $6\ \Omega$  (AB) for the circuit shown in fig 6b, using Kirchhoff's Laws. [6]



Figure 6b

- c) Calculate the current flowing through  $6\ \Omega$  (AB) for the circuit shown in question 6b, using Thevenin's Theorem. [8]
- Q7) a) Define resistivity of the material & state the factors on which it depends. [3]  
 b) Explain construction and working principle of Lithium Ion battery and state its any two applications. [6]  
 c) Derive an expression for insulation resistance of a single core cable. Draw the necessary diagram. Also comment on insulation resistance when [8]

- i) Two cables are connected in series and
- ii) In parallel

OR

**Q8)** a) Write the name of materials used for anode, cathode and electrolyte in case of Lead Acid Battery. State its any three applications. [3]

b) If  $\alpha_1$  and  $\alpha_2$  are the RTC of a conducting material at  $t_1^\circ\text{C}$  and  $t_2^\circ\text{C}$

respectively prove that  $\alpha_2 = \frac{\alpha_1}{1 + \alpha_1(t_2 - t_1)}$  [6]

c) A water pump lifts 12000 litre of water to a height of 15 m per minute. The efficiency of motor and pump is 75% & 80% respectively. Calculate [8]

i) Input power to motor in kW

ii) Daily energy consumption if pump is used 04 hrs a day

iii) Monthly electricity bill as per above daily uses for the month of 30 days at the rate of 10 Rs/unit.

