

# 17331

**11920**

**3 Hours / 100 Marks**

Seat No.

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- Instructions* –
- (1) All Questions are *Compulsory*.
  - (2) Answer each next main Question on a new page.
  - (3) Illustrate your answers with neat sketches wherever necessary.
  - (4) Figures to the right indicate full marks.
  - (5) Assume suitable data, if necessary.
  - (6) Use of Non-programmable Electronic Pocket Calculator is permissible.
  - (7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

**Marks**

**1. a) Attempt any SIX of the following:**

**12**

- (i) State ohm's law.
- (ii) Define R.M.S. value. What is it's relation in maximum value for sinusoidal waveform?
- (iii) Define voltage ratio and current ratio.
- (iv) Define phase sequence in 3-phase a.c. supply.
- (v) State any two applications of shaded pole induction motor.
- (vi) Define power factor of an a.c. circuit. State it's value for purely capacitive circuit.
- (vii) State the examples of statically and dynamically induced EMF.
- (viii) State the causes of electric shock.

P.T.O.

b) Attempt any TWO of the following:

8

(i) Define the following terms:

- (1) Frequency
- (2) Cycle
- (3) Time period
- (4) Crest factor

(ii) Explain impedance of an a.c. circuit and its unit. State the factor on which it depends.

(iii) State any four advantages of 3-phase supply system over single phase supply system.

2. Attempt any FOUR of the following:

16

a) Find the current in  $6\ \Omega$  resistance using KVL for the Figure No.1.

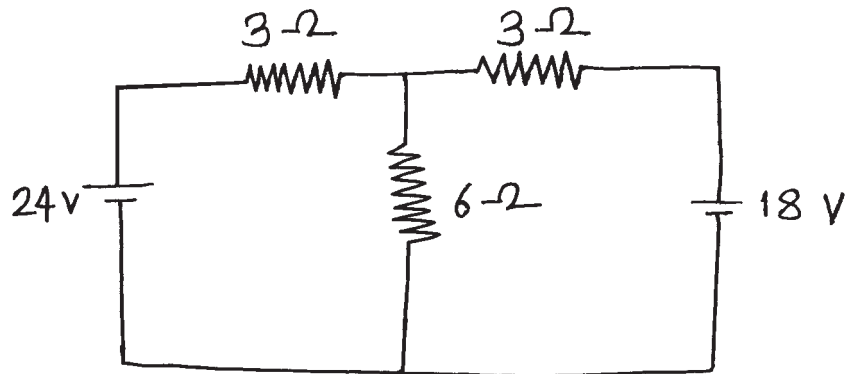
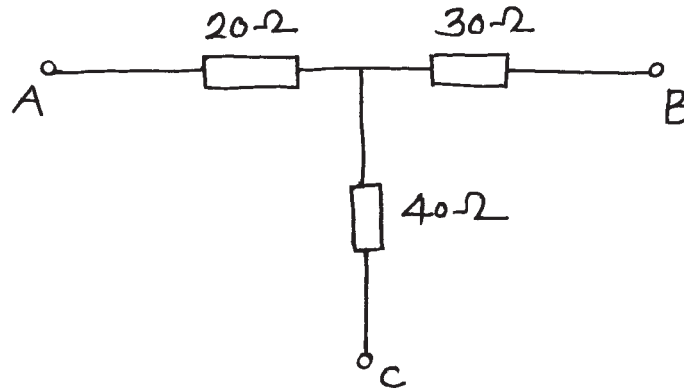


Fig. No. 1

b) For pure inductive circuit, derive the relationship between voltage and current.

c) Draw the waveform, equation and phasor diagram of a simple resistive circuit when a.c. is applied across it.

- d) Convert the given star into equivalent delta shown in Figure No. 2.



**Fig. No. 2**

- e) Three impedances each of  $2 \Omega$  resistances and  $2 \Omega$  inductive reactance are connected in mesh across a 3-phase, 400 volt, a.c. supply. Determine the phase current, line current and its active and reactive power.
- f) Draw a labelled diagram showing constructional details of shell type single phase transformer. State its working principle.

**3. Attempt any FOUR of the following:**

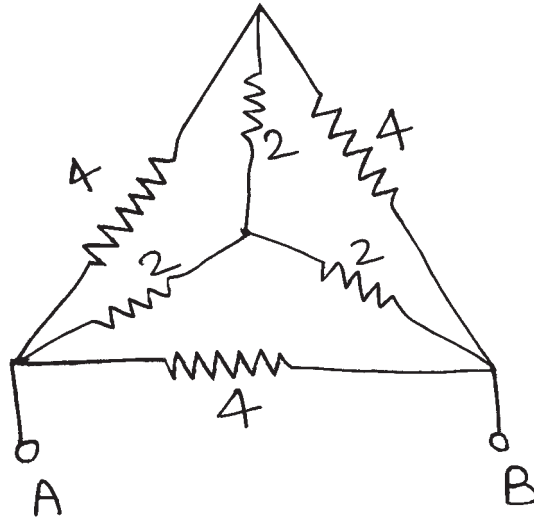
**16**

- a) Compare a series and parallel circuit with following parameters.
- Equivalent resistance
  - Circuit current
  - Circuit diagram
  - Voltage drop across each resistor.
- b) State and explain Faraday's law and Lenz's law.
- c) Explain the construction and principle of operation of dynamometer type instrument.
- d) Explain the concept of balance load and unbalance load.
- e) Draw the labelled diagram of resistance split phase and capacitor start motor.
- f) State any four precautions to be taken against electrical accidents.

4. Attempt any **FOUR** of the following:

16

- a) Calculate the equivalent resistance between A and B using Star-Delta conversion for Figure No. 3.

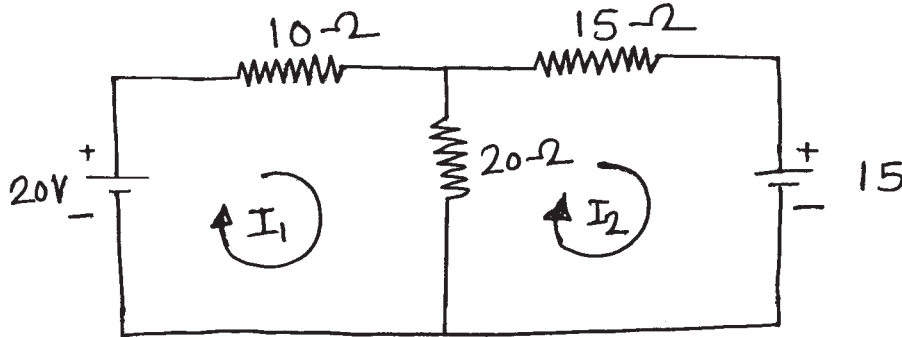
**Fig. No. 3**

- b) An alternating current is represented by  $i = 70.7 \sin 520 t$ . Determine:
- Frequency
  - Current at 0.0015 sec after passing through zero increasing positively.
- c) A resistance of  $100 \Omega$ , an inductance of  $0.2 \text{ H}$ , and a capacitance of  $150 \mu\text{f}$  connected in series across a 230 volt, 50 Hz a.c. supply. Calculate current drawn by circuit, power factor, its nature and power consumed by the circuit.
- d) Draw the phasor diagram for a series R-L circuit and label it.
- e) For star and delta connected loads, state the numerical relationship between
- Line current and Phase current
  - Line voltage and Phase voltage. Also state the expression of powers.
- f) State the meaning of the terms 'Voltage regulation' and 'Efficiency' of transformer.

5. Attempt any FOUR of the following:

16

- a) Using mesh analysis, find the loop currents

 $I_1$  and  $I_2$  in Figure No. 4.Fig. No. 4

- b) Draw the phasor diagram and waveform of pure resistive and pure capacitance. Write voltage and current equation for the same.
- c) An R-L-C series circuit with a resistance of  $20\ \Omega$ , inductance of  $0.25\ \text{H}$  and capacitance of  $100\ \mu\text{f}$  is supplied with a 240 volt variable a.c. supply.

Calculate:

- (i) Resonance frequency
  - (ii) Current at this condition
  - (iii) Power factor
  - (iv) Quality factor
- d) Explain the working of universal motor. Give its two applications.
- e) Differentiate between an auto transformer and conventional single phase transformer with respect to construction (with diagram), saving in copper, application, cost and efficiency.
- f) State merits of MCB over fuse.

**6. Attempt any FOUR of the following:****16**

- a) An alternating voltage is represented by following expression  
 $V = 25 \sin (200 \pi t)$

Calculate :

- (i) Peak value
  - (ii) Form factor
  - (iii) Frequency
  - (iv) Crest factor
- b) Explain the concept with neat waveform of lagging and leading phase difference.
- c) Draw the circuit diagram of R-C and R-L-C series circuit. Draw the impedance triangle and power triangle for the same circuit.
- d) Draw the power triangle. State the formulas for active, reactive power and apparent power.
- e) Name the single phase motor used for following applications.
- (i) Electric mixer
  - (ii) Toys
  - (iii) Compressor
  - (iv) Ceiling fan.
- f) Compare between the core type and shell type single phase transformer.
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