

11819

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.

**Marks****1. (A) Attempt any SIX of the following :****12**

- (a) Define the following for an electrical network :
  - (i) Node
  - (ii) Loop
- (b) State Kirchoff's voltage law.
- (c) Draw a parallel electric circuit. Write the expression for equivalent resistance.
- (d) Define crest factor and form factor.
- (e) Draw the impedance triangle of series RC circuit. Write the expression for magnitude of impedance.
- (f) Draw the voltage waveform of a 3 –  $\phi$  supply with respect to time.
- (g) What is earthing ? State its importance.
- (h) State the necessity of fuse.

**(B) Attempt any TWO of the following :****8**

- (a) Compare auto transformer & two winding transformer on the basis of
  - (i) construction
  - (ii) cost
  - (iii) efficiency
  - (iv) application
- (b) Explain the working of resistance split phase induction motor with a neat diagram.
- (c) Draw a neat diagram of plate earthing.

## 2. Attempt any FOUR of the following :

16

- (a) Determine the current through  $20\ \Omega$  resistance using Nodal voltage method in the fig. 1.

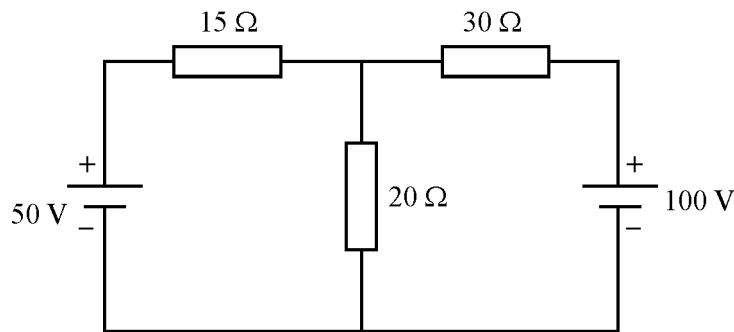


Fig. 1

- (b) For the circuit given in fig. 2 find the current  $I$  through  $10\ \Omega$  by mesh analysis method.

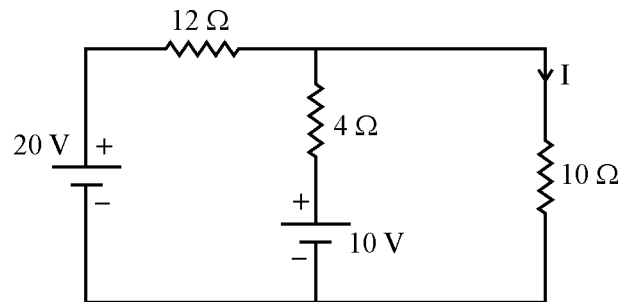


Fig. 2

- (c) Define the following terms with respect to A.C.
- |                 |                       |
|-----------------|-----------------------|
| (i) amplitude   | (ii) frequency        |
| (iii) RMS value | (iv) angular velocity |
- (d) Draw A.C. waveforms showing
- |                           |                              |
|---------------------------|------------------------------|
| (i) lagging quantities    | (ii) leading quantities      |
| (iii) in phase quantities | (iv) out of phase quantities |
- (e) Draw series R-L-C circuit and describe resonance.
- (f) Draw and explain the circuit diagram for measurement of single phase power using dynamometer type wattmeter.

## 3. Attempt any FOUR of the following :

16

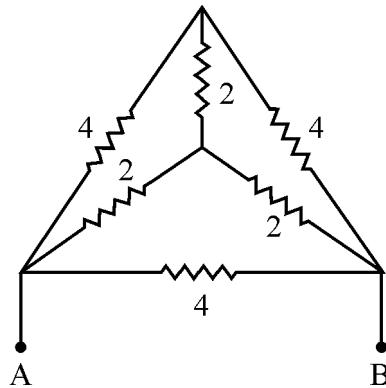
- (a) Explain two methods of statically induced emf.
- (b) Draw the circuit diagram, waveforms, phasor diagram of a simple resistive circuit, when ac is applied across it. Write voltage and current equations.

- (c) State Faraday's laws of electro-magnetic induction and explain.
- (d) An alternating voltage is represented by the following equation,  
 $v = 25 \sin 200 \pi t$ .  
 Find,  
 (i) amplitude (ii) time period  
 (iii) angular velocity (iv) frequency
- (e) For R-L series circuit, write voltage and current equations. Write the equation for power and state the nature of power factor.
- (f) State different types of power in ac circuits. Write the expression and units for the same. Draw the power triangle.

4. Attempt any FOUR of the following :

16

- (a) Calculate the equivalent resistance between A & B using star-delta conversion for fig. 3.



(All resistances are in  $\Omega$ )

Fig. 3

- (b) Draw the schematic circuit diagram of ac flowing through pure inductance. Write the expression for voltage and current. Draw the phasor diagram.
- (c) Define power factor. State its significance. What is the condition for unity power factor ?
- (d) Draw the impedance triangle for series RLC circuit for  
 (i)  $X_L > X_C$  (ii)  $X_C > X_L$
- (e) State and explain the working principle of capacitor start single phase induction motor.
- (f) Draw a labelled diagram showing constructional details of core type single phase transformer. State its working principle.

P.T.O.

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

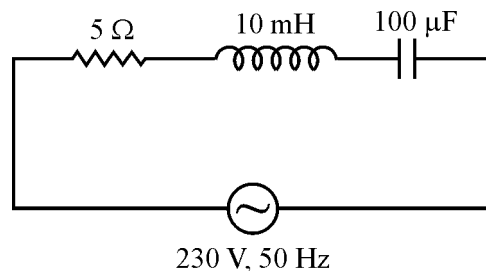
16

- (a) A  $318 \mu\text{F}$  capacitor is connected across  $230 \text{ V}$ ,  $50 \text{ Hz}$  system. Determine capacitive reactance, RMS value of current and equations for voltage and current.
- (b) Write the relationship for phase and line voltages & currents for the following :  
 (i) star connected system      (ii) delta connected system
- (c) Explain the following terms in  $3 \phi$  :  
 (i) phase sequence      (ii) balanced load
- (d) Three impedances of  $(8 + j6) \Omega$  each are connected in star to a  $3 \phi$ ,  $440 \text{ V}$ ,  $50 \text{ Hz}$  balanced ac supply. Calculate line voltage, phase voltage, line current, phase current, power and power factor.
- (e) List any four advantages of  $3 \phi$  systems over  $1 - \phi$  systems.
- (f) Define voltage regulation and efficiency of single phase transformer.

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

16

- (a) For the circuit given in fig. 4, calculate :  
 (i)  $X_L$       (ii)  $X_C$   
 (iii)  $Z$       (iv) Current ( $I_{\text{rms}}$ )

**Fig. 4**

- (b) A coil of resistance  $10 \Omega$  and inductance  $0.1 \text{ H}$  is connected in series with a capacitor of  $150 \mu\text{F}$  across  $220 \text{ V}$ ,  $50 \text{ Hz}$  supply. Calculate :  
 (i) impedance      (ii) current  
 (iii) active power      (iv) power factor
- (c) Distinguish between star connected system and delta connected system.
- (d) State the emf equation of transformer and write meaning of each term. Also, define transformation ratio.
- (e) State the principle of operation of universal motor with a neat diagram.
- (f) State any four safety precautions against electric shock.