17331

21819

3 Hours / 100 Marks Seat No. | | | | | | | | |

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) Define the terms with respect to electrical circuits.

1) Node

2) Branch

(ii) State Kirchoff's current law.

(iii) Draw a parallel resistive circuit with three resistors. State the formula for equivalent resistance.

(iv) Define form factor of sinusoidal signal. State its value.

(v) Define three phase balanced load and unbalanced load.

(vi) State Lenz's law.

(vii) Explain the need of earthing.

(ix) State the function of

1) MCB

2) Fuse

Marks

b) **Attempt any TWO of the following:** **8**

(i) Write the emf equation of single phase transformer. State the meaning of each term in it.

(ii) Draw a neat diagram of Resistance Split Phase Induction motor. State any two applications of it.

(iii) Write any four safety precautions to be taken while working with any electrical system.

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

a) Explain Kirchhoff's Voltage Law with a suitable example.

b) Calculate the current through 10 Ω resistors for the following circuit Fig. No. 1 by loop current method.

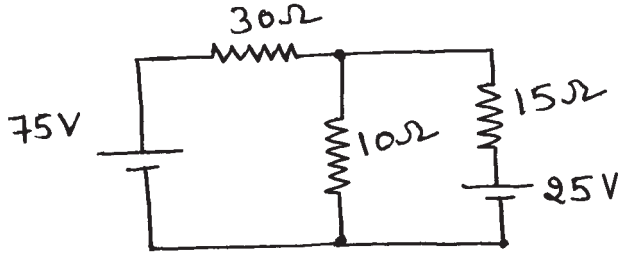


Fig. No. 1

c) Find the value of R_{12}, R_{23} and R_{31} for the following circuit in Fig. No. 2.

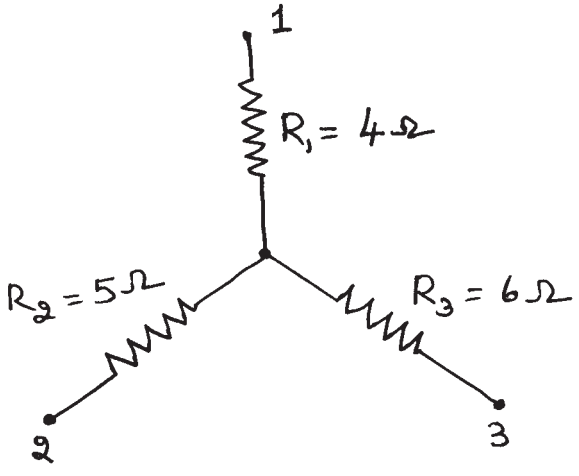


Fig. No. 2

Marks

d) State the two types of statically induced emf with neat diagram and explain.

e) Define power factor. State its significance.

f) State the working principle of single phase dynamometer type wattmeter with a neat labeled diagram.

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

a) Draw the circuit, waveform and write equations of voltage and current for a purely capacitive circuit.

b) Draw Lag and Lead quantities with respect to sinusoidal signals. State its equations.

c) State Faraday's law of electromagnetic induction and its application (any two) in electrical engineering.

d) Calculate amplitude, rms value, time period and phase angle for $e = 100 \sin (314\ t + 30°)$

e) Draw the voltage and current waveforms of purely resistive circuit containing 70 Ω resistors, when a supply voltage of 115 V, 50 Hz is applied. Label the waveforms with amplitude and its equations.

f) State any four advantages of 3-ϕ systems over 1-ϕ systems.

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

a) The equivalent resistances of two resistors when connected in parallel and series are 10 Ω and 45 Ω respectively. Calculate their values.

b) State the behavior of an AC circuit containing pure inductance, through equations, waveforms, phasor diagrams for voltage and current.

c) Define active power and reactive power. Differentiates these two, based on the following:

(i) Equation

(ii) Unit of measurement

d) Explain resonance in R-L-C series circuit.

e) State the principle of operation of a single phase transformer with neat diagram.

Marks

f) Define the following with respect to transformers:
   (i) Voltage ratio
   (ii) Transformation ratio
   (iii) Efficiency
   (iv) Regulation

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

a) Given the voltage and current equations for an ac circuit.
   $V = 100 \sin (wt + 30°)$ and $I = 15 \sin (wt + 60°)$
   Determine:
   (i) Phase difference
   (ii) Power factor
   (iii) Impedance
   (iv) V_{rms}

b) State relationship between voltage and current quantities in Star connected system and Delta connected system.

c) Draw three phase circuit showing supply and star connected load. Show different line and phase quantities in it.

d) Three similar coils each having a resistance of 20 Ω and inductance of 0.05 H are connected in star to a 3-ϕ, 400 V, 50 Hz supply. Calculate:
   (i) Line Current
   (ii) Total power absorbed.

e) Calculate:
   (i) Line current
   (ii) Phase current
   (iii) Power factor
   (iv) Total power for the given balanced load in Fig. No. 3.

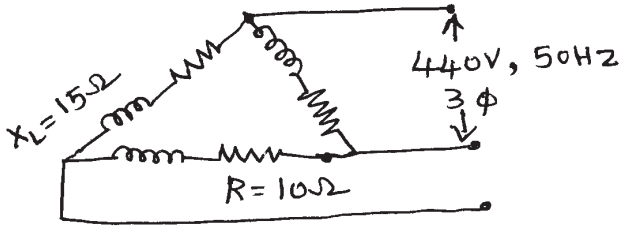


Fig. No. 3

Marks

f) A 50 kVA, 6600 V/250 V, 1-ϕ transformer has 52 secondary turns. Find:

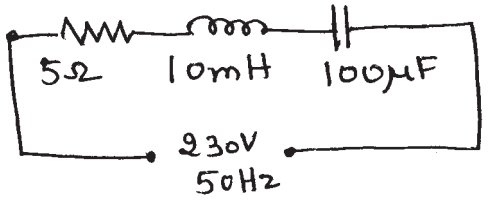
(i) No of primary turns

(ii) Full load primary and secondary currents.

6. Attempt any <u>FOUR</u> of the following: **16**

a) A coil of resistance 40 Ω and 0.08 H inductance is connected to 230 V, 50 Hz supply. Find impedance, reactance, current and power factor.

b) For the circuit given below in Fig. No. 4. Calculate X_L, X_C, Z and current I_{rms}.



<u>Fig. No. 4</u>

c) Three impedance of (8 + j6) each are connected in star to a 3-ϕ, 440 V, 50 Hz balanced Ac supply. Calculate:

(i) Line and phase voltages

(ii) Line and phase currents

(iii) Impedance

(iv) Power factor.

d) Give any two applications of each:

(i) Universal motor

(ii) Transformer

(iii) Resistance split phase induction motor

(iv) Capacitor start induction motor.

e) Explain the reason why single phase induction motor is not self starting.

f) State any four careful actions to be performed while handling shock victims.