21314

17323

3 Hours/100 Marks

Seat No. | | | | | | | | |

Instructions : (1) ***All*** *questions are* ***compulsory***.

(2) *Illustrate your answers with* ***neat*** *sketches* ***wherever*** *necessary.*

(3) *Figures to the* ***right*** *indicate* ***full*** *marks.*

(4) *Assume suitable data, if* ***necessary***.

(5) *Use of non-programmable electronic pocket calculator is* ***permissible***.

MARKS

1. Attempt **any ten** of the following. **20**

a) Define cycle and time period related to sinusoidal A.C. waveform.

b) An alternating current is represented by the following expression :

$i = 10 \sin (100\,\pi t)$

Calculate :

i) Frequency

ii) R.M.S. value of current.

c) Define power factor. What is the status of power factor in case of R-L series circuit ?

d) Draw the impedance triangle for R-L series circuit.

e) Explain in short the concept of A.C. parallel circuit with neat circuit diagram.

P.T.O.

MARKS

f) Define the components of admittance.

g) Draw a neat circuit of star connected load connected to Δ connected source.

h) Write the equation for three phase ac voltages if they are displaced by 120°.

i) Write the procedure to transform voltage source to current source.

j) State maximum power transfer theorem.

k) State Thevenin's theorem.

l) State the behaviour of following elements at the time of switching i.e. transient period

i) L ii) C

2. Attempt **any four** of the following. **16**

a) If the e.m.f. is represented by the equation e = 25 sin (314 t), what is its amplitude, R.M.S. value, frequency and time period ?

b) Derive the expression for current in pure inductor circuit when connected to sinusoidal A.C. voltage with graphical representation.

c) Draw a circuit diagram of R.C. series circuit. Draw impedance triangle and power triangle for same circuit .

Marks

d) Write down the formula/expression for

1) Active power

2) Reactive power

3) Apparent power

4) Power factor (Related with above power).

e) Find out the resistance and capacitance of the given impedance.

i) $25/-45^\circ\ \Omega$

ii) $10 - j\,15\ \Omega$

f) A resistance of $75\ \Omega$ and $60\ \mu F$ are connected in series across 230 V, 50 Hz supply find,

i) X_c

ii) Current

iii) Power factor

iv) Active power.

3. Attempt **any four** of the following. **16**

a) Explain the concept of series resonance in RLC series circuit with the help of graphical representation.

b) Compare series and parallel resonant circuit (any four points).

MARKS

c) Two impedances $Z_1 = 8 + j\,6\ \Omega$ and $Z_2 = 4 + j4\ \Omega$ are connected in parallel across 200 V, 50 Hz a.c supply. Calculate the

i) branch current (i_1)

ii) branch current (i_2)

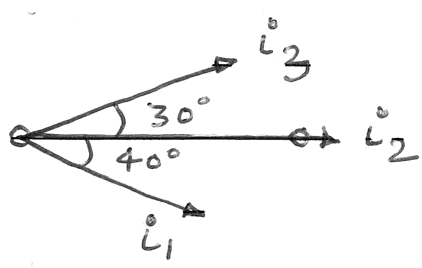
iii) total current (i_T)

Draw the phasor diagram.

d) A resistance of 100 Ω , an inductance of 0.2 H and capacitance of 150 μ F are connected in series across 230 V, 50 Hz a.c supply. Calculate the current drawn by the circuit, power factor of the circuit, its nature and power consumed by the circuit.

e) From the following phasor diagram

i) Identify the leading current and logging current, if i_2 is reference phasor.



ii) How many degrees does i_1 lags by i_3 ?

MARKS

f) Voltage across a coil is 146.2 V and across a series resistance is 150 V when they are connected across 220 V, 50 Hz supply, if supply current is 10 amp find

i) Resistance of coil

ii) Inductance of coil

iii) Power consumed by coil

iv) P.F. of total circuit.

4. Attempt **any four** of the following. **16**

a) Compare three phase system with single phase system (any 4 points).

b) Three identical coils each having resistance of 15 Ω and inductance of 0.03H are connected in delta across a 3 phase, 440 V, 50 Hz supply. Calculate

i) I_{ph}

ii) I_L

iii) Power consumed

iv) Draw phasor diagram.

c) Three identical coils having impedances of $(17.32 + j10)\ \Omega$ each are connected in star across a 3 phase, 50 Hz, 400 V supply. Find :

i) $\cos\phi$

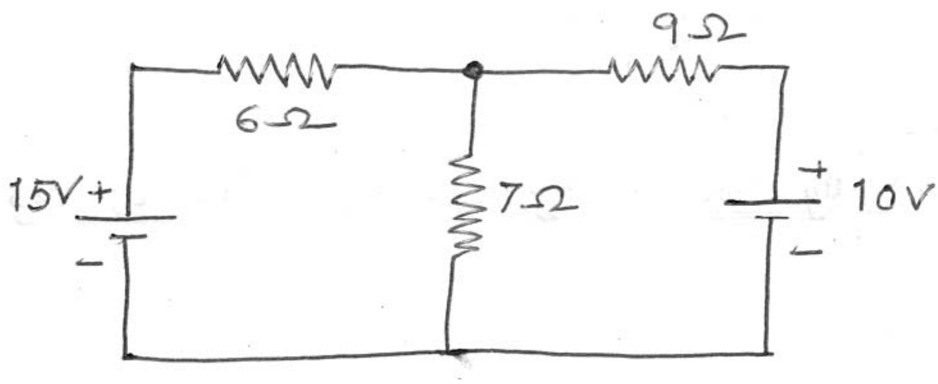
ii) power supplied

iii) if same coils are connected in delta. Calculate the power taken by the load.

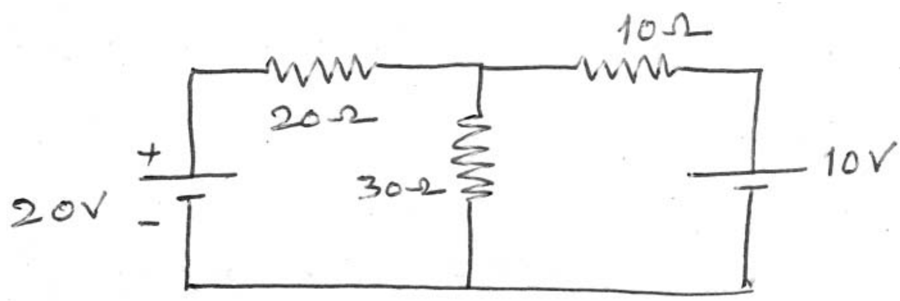
MARKS

d) Derive the formula for star to delta transformation.

e) Find current through 7 Ω resistance using mesh analysis in the circuit below.



f) For the circuit shown below calculate current through 70 Ω resistance using nodal analysis.

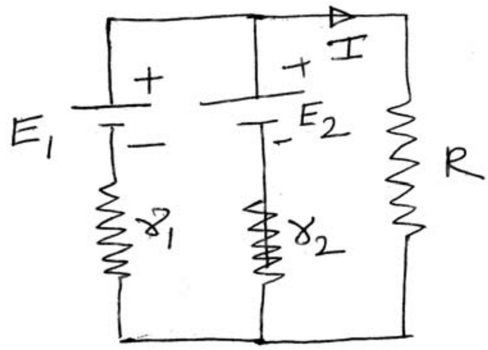


5. Attempt **any two** of the following. **16**

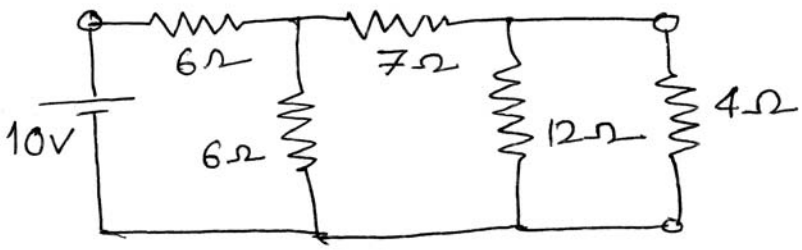
a) With the help of necessary phasor diagram derive the relationship between line and phase voltage, line and phase current in balanced star connected load, excited from 3 phase A.C. supply.

MARKS

b) State superposition theorem and write its procedural steps to find current I from following circuit diagram.

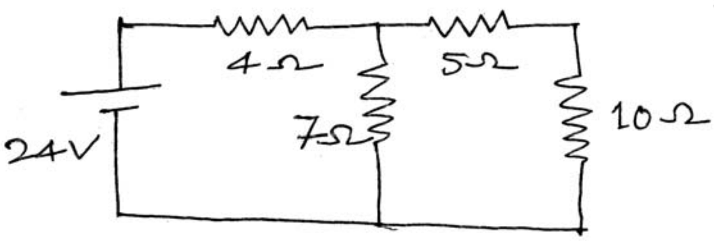


c) State Norton's theorem and apply theorem to find current flowing through 4 Ω resistance.



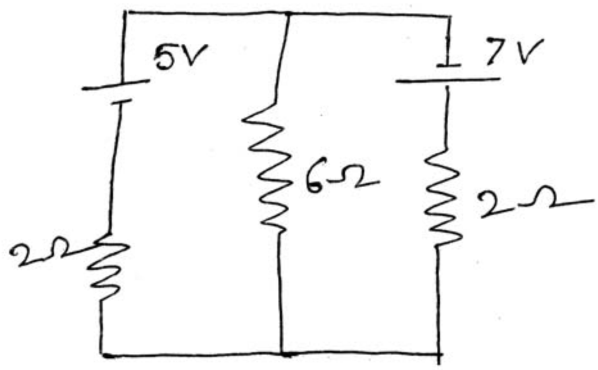
6. Attempt **any four** of the following. **16**

a) Apply Thevenin's theorem to find current flowing through 10 Ω resistor in the circuit shown.

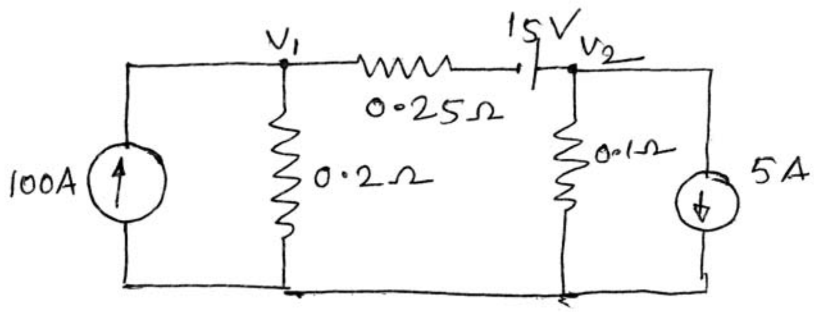


MARKS

b) Find out the current through 6 Ω resistor using superposition theorem from the fig. shown.



c) Find the node voltages V_1 and V_2 in the circuit shown.



d) Draw impedance triangle and power triangle for R.C. series circuit.

e) Explain the concept of initial and final conditions in switching circuits for the elements R and L.

f) Draw sinusoidal a.c. waveform for voltage and current if current lags voltage by 30° and current leads the voltage by 30°.