17323

14115

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.

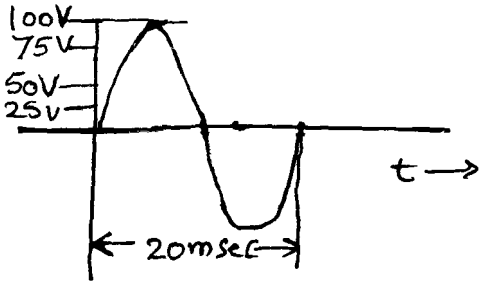
(5) Use of Non-programmable Electronic Pocket Calculator is permissible.

Marks

1. Attempt any <u>TEN</u> of the following: **20**

a) Define cycle and time period related to a.c. waveform.

b) Find frequency and amplitude of the following waveform. Refer Figure No. 1



<u>Fig. No. 1</u>

Marks

c) Define active power and reactive power for R-L-C series circuit.

d) Draw impedance triangle and voltage phasor diagram for R-L series circuit.

e) Define susceptance and admittances for a parallel circuit.

f) Define quality factor for parallel resonance and write its mathematical expression.

g) Draw sinusoidal waveform of 3-phase emf and indicate the phase sequence.

h) Draw circuit diagrams showing additive polarity and subtractive polarity.

i) Write the procedure of converting a current source into voltage source.

j) State superposition theorem applied to D.C. circuits.

k) State maximum power transfer theorem for D.C. circuits.

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

(i) Pure L

(ii) Pure C.

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

a) An e.m.f. source represented by e = 20 sin 314*t* is connected to a pure inductance having value 10 mH. Find:

(i) The equation of current flowing through it

(ii) Draw the waveforms of voltage and current.

b) Derive the expression for current in pure capacitive circuit when connected to sinsoidal a.c. source. Draw the phasor diagram.

Marks

c) For given waveform. Refer Figure No. 2:

(i) Identify type of circuit

(ii) State nature of p.f.

(iii) Draw phasor diagram

(iv) Write expressions for voltage and current.

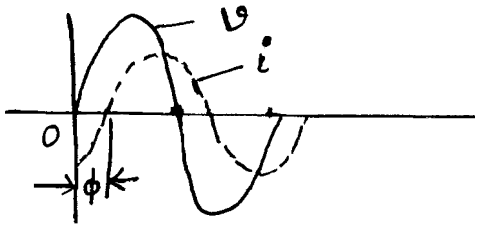


Fig. No. 2

d) Draw graphical representation of resistance, inductive reactance, capacitive reactance and impedance related to frequency for series resonance circuit.

e) An alternating voltage of 250 V, 50 Hz is applied to a coil which takes 5 A of current. The power absorbed by the circuit is 1 KW. Find the resistance and inductance of the coil.

f) A R-L-C series circuit with a resistance of 20 Ω, inductance of 0.25 H and capacitance of 100 μF is supplied with 240 V variable a.c. supply calculate:

(i) Resonance frequency

(ii) Current at this condition

(iii) Power factor

(iv) Quality factor.

Marks

3. Attempt any FOUR of the following: 16

a) Compare series resonance to parallel resonance on the basis of:

(i) Resonant frequency

(ii) Impedance

(iii) Current and

(iv) Magnification.

b) Derive the expression for resonance frequency for a R-L-L parallel circuit.

c) A choke coil has a resistance of 2 Ω and an inductance of 0.035 H is connected in parallel with a 350 μF capacitor which is in series with a resistance of 20 Ω. When the combination is connected across a 200 V, 50 Hz supply. Calculate:

(i) The total current taken and

(ii) Power factor of whole circuit.

d) A coil of resistance 4 Ω and inductance 0.07 H is connected in parallel with another coil of resistance 10 Ω and inductance 0.12 H. The combination is connected across 230V, 50 Hz supply. Determine total current and current though each branch.

e) Define the following terms:

(i) Lagging quantity

(ii) Leading quantity

Also represent the above terms for voltage and current in pure inductance and pure capacitance circuit.

f) A 200 W, 100 V lamp is connected in series with a capacitor to a 120 V, 50 Hz a.c. supply calculate:

(i) The capacitance required

(ii) The phase angle between voltage and current.

Marks

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

a) Draw the waveforms of a 3-phase emf. with following phase sequence.

(i) R-B-Y

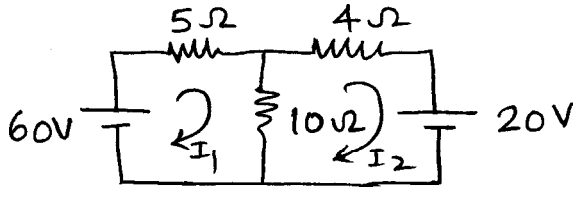
(ii) B-R-Y

b) Three coils each with a resistance of 10 Ω and inductance of 0.35 mH are connected in star to a 3-phase, 440 V, 50 Hz supply. Calculate the line current and total power taken per phase.

c) A delta connected induction motor is supplied by 3-phase, 400 V, 50 Hz supply. The line current is 43.3 A and the total power taken from the supply is 24 KW. Find the resistance and reactance per phase of motor winding.

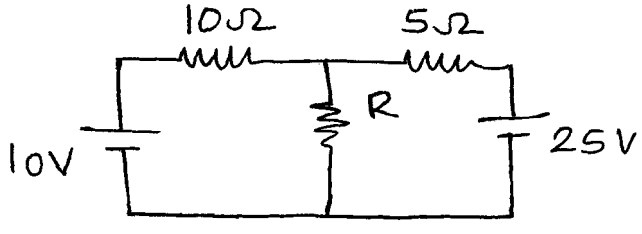
d) Derive the formulae for star to delta transformation.

e) Using mesh analysis calculate voltage drop across 10 Ω resistance in following circuit. Refer Figure No. 3



<u>Fig. No. 3</u>

f) For following circuit calculate resistance R. using Node analysis. Refer Figure No. 4.



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

Marks

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

a) With the help of phasor diagram, derive the relationship between line and phase values in a balanced star connected 3-phase supply.

b) State the Norton's theorem. Also write stepwise procedure for applying. Norton's theorem to simple circuit.

c) Calculate current through each branch using superposition theorem. Refer Figure No. 5

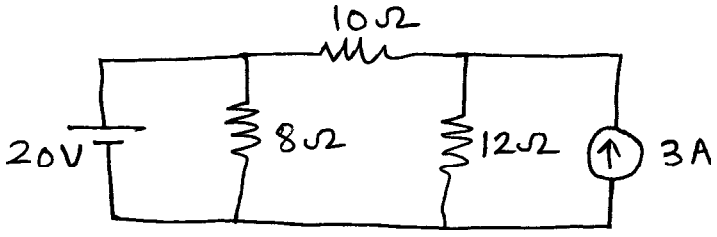


Fig. No. 5

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

a) Convert following circuit into Thevenin's circuit across A and B. Refer Figure No. 6

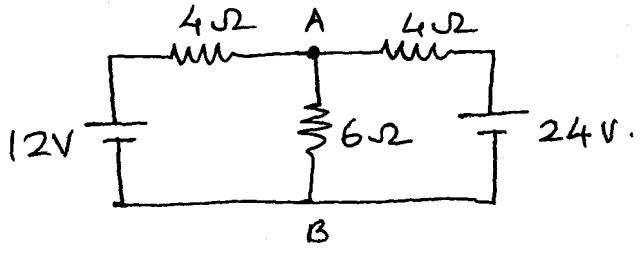


Fig. No. 6

Marks

b) Calculate the value of R_L in following circuit using maximum power transfer theorem for the transfer of maximum power to the load. Refer Figure No. 7

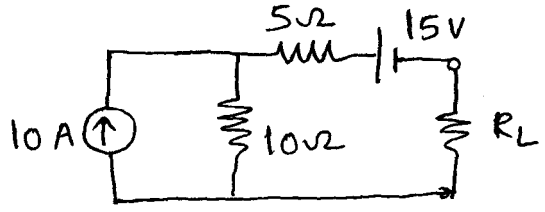


Fig. No. 7

c) Determine current through 10 Ω resistance using mesh analysis. Refer Figure No. 8

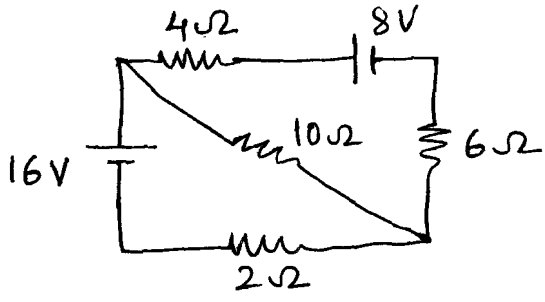


Fig. No. 8

d) Derive the expression for resonance frequency in a R-L-C series circuit.

e) Explain the concept of initial and final conditions in switch circuits for R, L and C.

f) Draw the phasor diagram and waveforms of voltage, current and power in a pure inductance circuit supplied by a 1-phase a.c. source.