17323

15116

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.

Marks

1. Attempt any TEN of the following : 20

(a) Define RMS value and average value related to sinusoidal AC waveform.

(b) Define impedance and reactance related to single phase AC series circuit. Give the units of both.

(c) Define quality factor of parallel AC circuit and give its formula.

(d) What do you mean by balanced load and balanced supply in relation with polyphase AC circuits ?

(e) Give four steps to solve nodal analysis.

(f) Give statement of superposition theorem.

(g) Draw a waveform and phasor diagram for purely capacitive load.

(h) Draw voltage triangles for R-L and R-C single phase AC series circuits.

(i) Define admittance and conductance in relation with parallel circuits. Give formulas for the same.

(j) Give relation between line voltage and phase voltage in case of 3-Phase star connection and 3-Phase delta connection.

(k) Give four steps to solve mesh analysis.

(l) An alternating quantity is given by $i = 14.14 \sin 314t$. Find RMS value and angular frequency of the wave.

(m) What do you mean by bilateral network and unilateral network ?

(n) Define :

(i) Active network

(ii) Passive network

P.T.O.

2. Attempt any FOUR of the following : 16

(a) An alternating current is represented by the equation $i = 100 \sin (100 \pi t)$. How long will it take for the current to attain values of 20 A and 100 A ?

(b) Derive an expression for resonant frequency of a series RLC circuit.

(c) Give 4 comparison of series and parallel circuits.

(d) Give four advantages of polyphase circuits over 1-phase circuits.

(e) Derive the relationship between line voltage and phase voltage in star connected system with suitable phasor diagram.

(f) How initial and final conditions are used in switching circuits and in electronic circuits ?

3. Attempt any FOUR of the following : 16

(a) Impedances $Z_1 = (10 + j5)\ \Omega$ and $Z_2 = (8 + j6)\ \Omega$ are connected in parallel across $V = (200 + j0)$. Using the admittance method, calculate circuit current and the branch currents.

(b) An inductive coil $(10 + j40)\ \Omega$ impedance is connected in series with a capacitor of 100 μF across 230 V, 50 Hz, 1-Phase mains find :

(1) current through the circuit

(2) P.F. of the circuit

(3) power dissipated in the circuit

(4) Draw phasor diagram

(c) What are in phase quantities ? What is phase sequence ?

(d) What is the importance of initial and final conditions of elements in a network.

(e) Give statement for :

(1) Thevenin's theorem and

(2) Norton's Theorem

(f) Find the value of Z in rectangular form :

$$Z = \frac{(3 + j4) \cdot 5 < 30}{(6 + j8)}$$

4. Attempt any FOUR of the following : 16

(a) Draw power triangle. State formulas for active power, reactive power and apparent power.

(b) Derive the expression for star to delta transformation.

(c) Find I, I_1 and I_2 of the circuit in fig. (1)

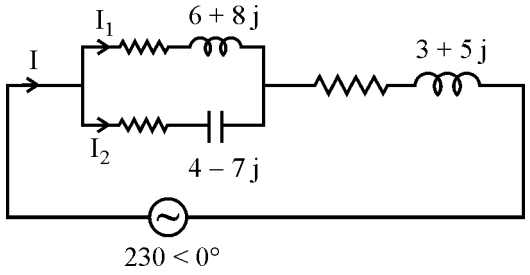

Fig. – 1

(d) Find the current in 6 Ω resistor in the circuit shown in fig. (2) using mesh analysis.

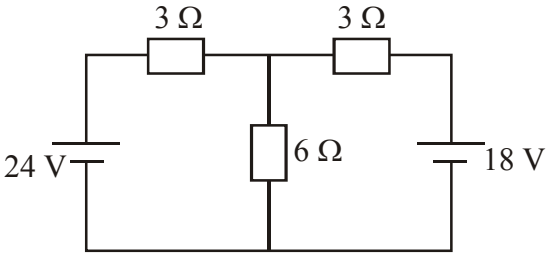

Fig. – 2

(e) Find the value of variable load resistance R_L, so that maximum power is transferred to R_L shown in fig. (3)

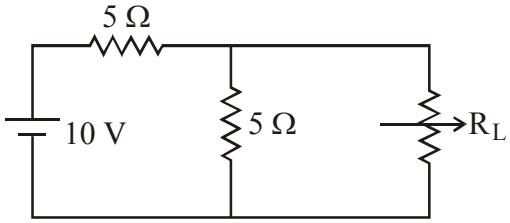

Fig. – 3

(f) Calculate the current in 1 Ω resistance in the network shown in fig. (4) using Norton's theorem.

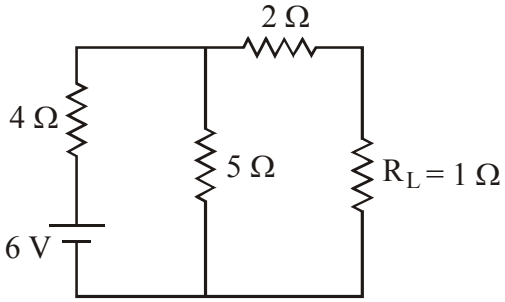

Fig. – 4

P.T.O.

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

(a) If $A = 4 + j7$

$B = 8 + j9$

$C = 5 - j6$

Find (a) $\frac{A + B}{C}$ (b) $\frac{AB}{C}$

(b) Find I_L for the circuit shown in fig. (5) using superposition theorem.

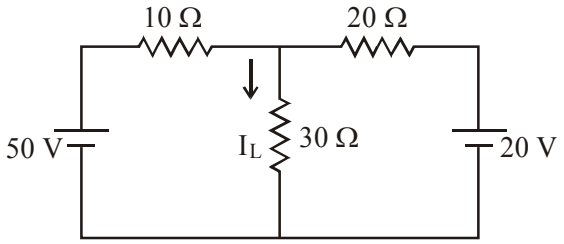

Fig. – 5

(c) Write and solve the node voltage equation for the circuit shown in fig. (6) using nodal analysis.

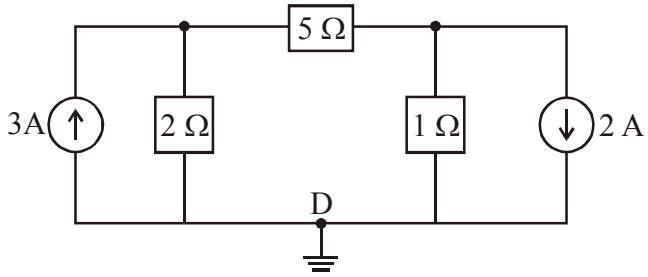

Fig. – 6

(d) What is the need of polarity marking in polyphase AC circuits ?

(e) Define in relation with AC waveform :

(i) Time period (ii) Cycle

(iii) Amplitude (iv) Crest factor

(f) State the value of p.f. during resonance condition. Define p.f. state the importance of p.f.

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

(a) Derive an expression for resonant frequency of a series RLC circuit.

(b) Write the steps for finding the current through an element by Thevenin's theorem.

(c) Explain with suitable example to convert a practical current source into an equivalent voltage source.

(d) Write the expression for impedance and power when an AC circuit contains (i) pure R (ii) pure L

(e) Define : (i) Circuit (ii) Loop (iii) Node (iv) Branch

(f) State the reasons for using star connection particularly for large capacity alternators ?