Total Number of Pages 4

Roll No. ...EP/123.....

FIRST SEMESTER

B.Tech.(GROUP-A)

END SEMESTER EXAMINATION

NOVEMBER-2010

EE-105 ELECTRICAL SCIENCES

Time: 3 Hours

Max. Marks : 70

Note : Answer any ***TEN*** questions.
All question carry ***EQUAL*** marks.
Assume suitable missing data, if any.

1 If the interconnection of sources shown in Fig.1 is valid, find the total power developed in the circuit. If the interconnection is not valid, explain why.

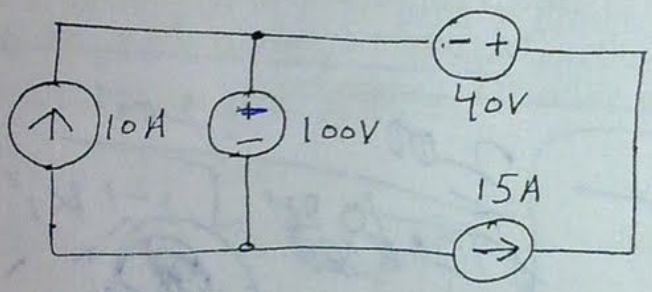

Fig.1

2 The current i_o in the circuit given in Fig.2 is 4A.

[a] Find i_1

[b] Find the power dissipated in each resistor.

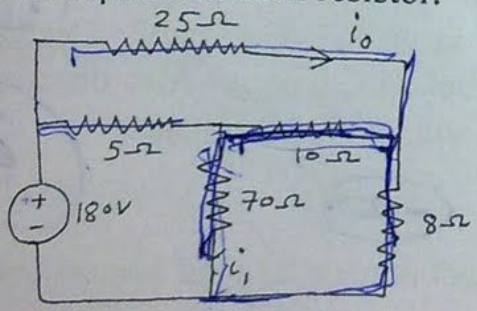

Fig.2

3 For the circuit given in Fig.3 find the Thevenin's equivalent with respect to the terminals a,b.

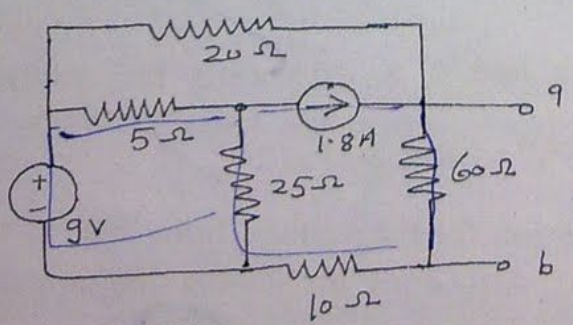

Fig.3

4 For the circuit given in Fig.4 determine I_2 using principle of superposition.

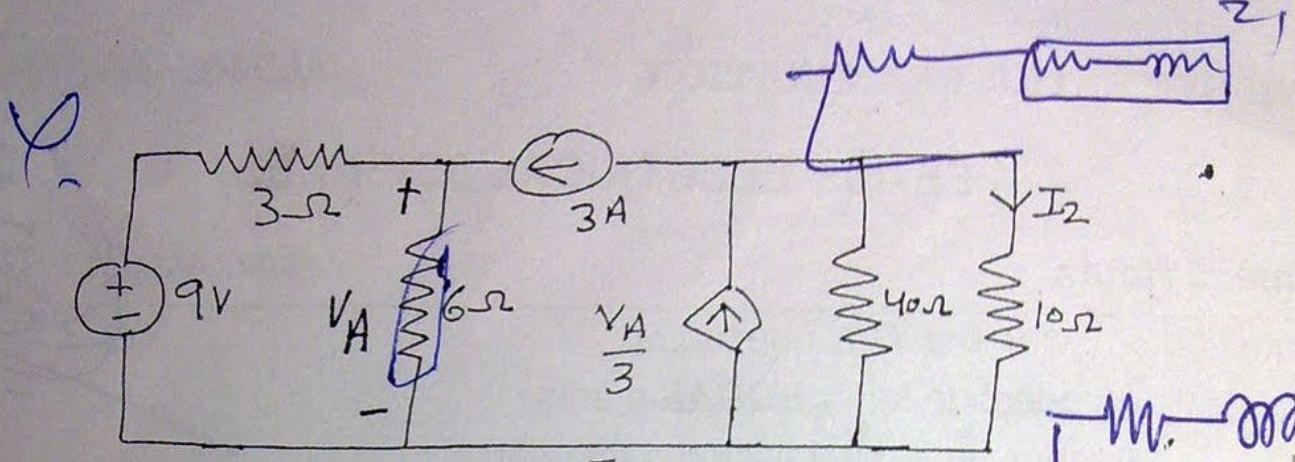

Fig-4

5 A non-inductive resistance of 10Ω is connected in series with an inductive coil across 200V, 50 Hz ac supply. The current drawn by the series combination is 10A. The resistance of the coil is 2Ω. Determine

(i) Inductance of the coil

(ii) Power factor of the coil

(iii) Voltage across of the coil

Also draw the phasor diagram showing all the voltages.

6 What is meant by resonance in an R-L-C circuit? Derive the expression for resonant frequency for a parallel RLC circuit. Also discuss the similarities and dissimilarities between series and parallel resonance.

7 A balanced three phase Y(star) connected load has an impedance of $4\angle 60°\Omega$ from line 'a' to neutral. If the voltage from line 'a' to neutral, $\overline{V}_{an} = 20\angle 30°$, determine

(i) current in phase 'b' and 'c'

(ii) voltage from line 'b' to neutral, $\overline{V}_{bn}$

(iii) the phasor expression for the voltage from line 'a' to line 'c', $\overline{V}_{ac}$. The phase sequence is abc. Also draw the phasor diagram showing the line and phase quantities.

How the total power in a balanced three phase load can be measured? Discuss the two wattmeter method for power measurement for a star connected load.

A 3-phase motor load has a power factor of 0.397 lagging. The two wattmeters connected to measure power show the input as 30 kW. Find the reading on each wattmeter.

9 What is an ideal transformer? How is a practical transformer different from ideal one? Draw and discuss the phasor diagram of a real transformer on load.

In a 50 kVA 1-phase transformer the iron loss is 500 W and full load copper loss is 800 W. Find the efficiency of the transformer at one half of full load.

10 A toroid is composed of three parts of different materials as shown in Fig.5. The mean lengths of the flux in the core along with the relative permeability for different sections are given as under:

$L_1 = 0.15m, \quad \mu_{r1} = 1447$

$L_2 = 0.30m, \quad \mu_{r2} = 5969$

$L_3 = 0.45m, \quad \mu_{r3} = 47750$

It is required to establish a flux of 0.6 mwb in the core. Calculate

(i) MMF required for each section to establish the required flux.

(ii) The excitation current of the coil .

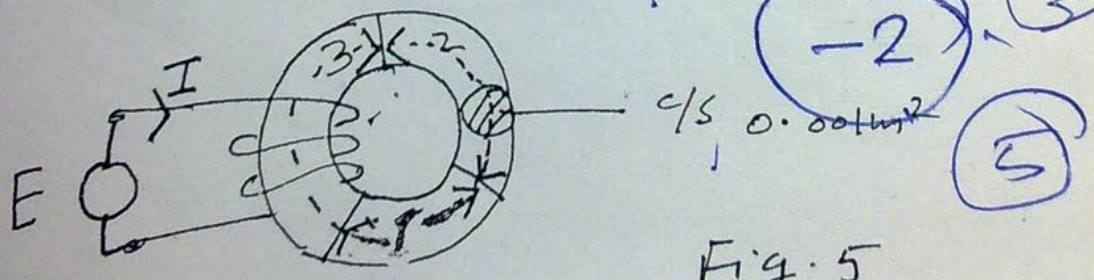

Fig. 5

11 Discuss the construction and principle of operation of a PMMC type instrument. Why it can't be used for measurement of AC currents and voltages?

12 Name the different types of 3- phase induction motors. Describe how a rotating magnetic field is produced in a 3-phase induction motor with the help of the necessary equations.

13 Draw the equivalent circuit of a 3-phase induction motor and therefrom derive the Torque-Speed characteristics. Under what condition the torque developed will be maximum?

14 Write short notes on any ***Two*** of the following:

[a] Auto transformer

[b] Maximum power transfer theorem.

[c] Moving Iron type instrument

[d] Tellegen's theorem.