SEM 1 – 5 (RC 16-17)

F.E. Semester – I (Revised in ~~2016~~-2017) Examination, May/June 2017

FUNDAMENTALS OF ELECTRICAL ENGINEERING

Duration : 3 Hours | Total Marks : 100

Instructions : *1) Answer **any two** questions from Part – **A**.*
*2) Answer **any two** questions from Part – **B**.*
*3) Answer **any one** question from Part – **C**.*
*4) **Assume** suitable data, **if required**.*

PART – A

1. a) Explain with the help of a schematic/block diagram the working of a nuclear power plant. **8**

   b) Describe in detail the working of a solar power plants. **8**

   c) In a series aiding connection, two coupled coils have an equivalent inductance L_A, in a series opposing connection L_B. Obtain an expression for M interms of L_A and L_B. **4**

2. a) Define the following terms :

      i) Active circuits

      ii) Ideal and practical voltage source. **4**

   b) Find the input resistance of the network shown in fig 2(b) across XX'. **8**

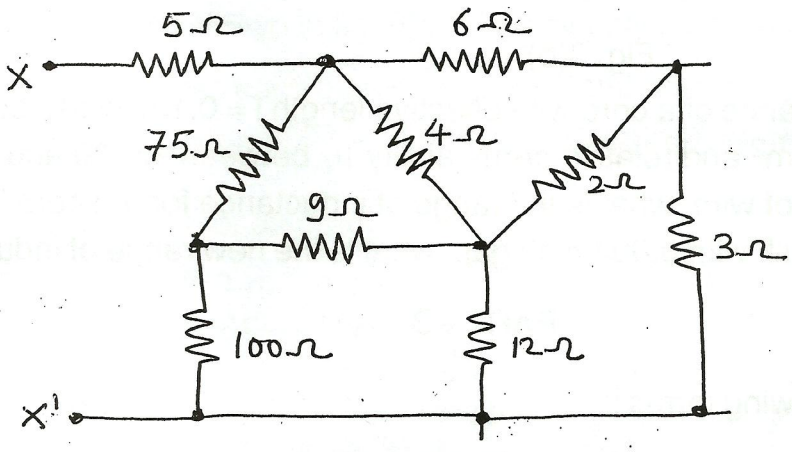

Fig. 2(b)

P.T.O.

c) Find the voltage across the 2.2KΩ resistor in fig. 2(c) using Norton's theorem. 8

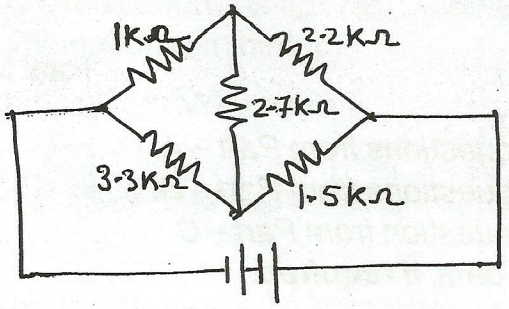

Fig. 2(c)

3. a) State and explain Thevenin's theorem. 5

b) Calculate the node voltages in the circuit shown in fig. 3(b). 7

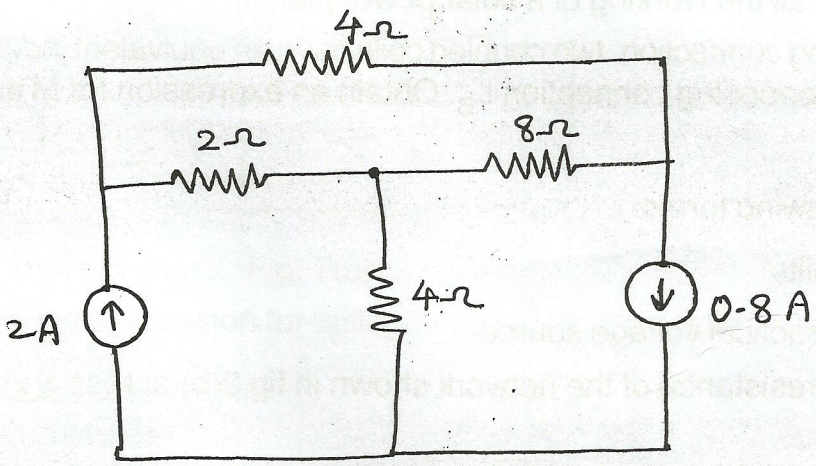

Fig. 3(b)

c) Find the inductance of a core with effective length l = 0.1m, cross-sectional area A = 0.001m^2 and relative permeability μ_r between 15000 and 25000. If N is 20 turns of wire, what is the range of inductance for the core ? If the same core is built with 0.002m air gap, what is the new range of inductance ? 8

PART – B

4. a) Define the following terms :

i) Maximum value ii) Phase angle

iii) Apparent power iv) Power factor. 8

b) A 4 ohm resistor is connected to a 10mH inductor across a 100V, 50Hz voltage source. Find

i) Impedance of the circuit ii) Power factor of the circuit. 4

c) Find I in the circuit shown in fig. 4(c). 8

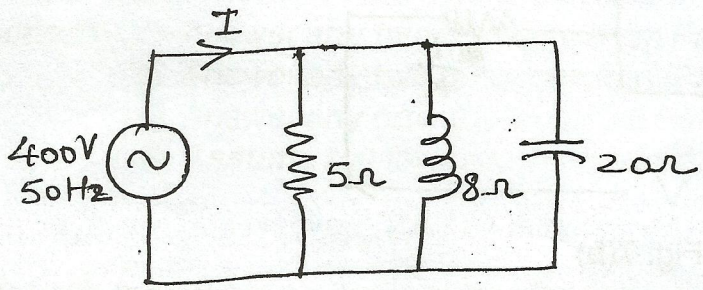

Fig. 4(c)

5. a) What are the characteristics of a balanced and unbalanced three phase power supply system ? Use phasor diagram to explain. 6

b) What are the different losses in a transformer ? 6

c) A single phase transformer, on no load has a core loss of 60W, draws a current of 3A and has an induced emf of 250V. Determine the no load power factor, core-loss current and magnetising current. Also calculate the no load circuit parameters of the transformer. Neglect winding resistance and leakage flux. 8

6. a) Describe how the various losses in a single phase transformer are measured and hence the efficiency is calculated without loading the transformer. 10

b) In the circuit shown in fig. 6(b), if the supply frequency is 25Hz, find

i) Drop across each element. ii) Total resistive and inductive drop.

iii) Supply voltage. iv) Power factor of the circuit. 10

Draw the phasor diagram.

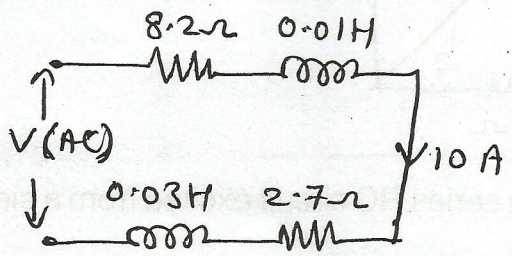

Fig. 6(b)

PART – C

7. a) Write an analogy between electrical and magnetic circuits. 5

b) For the circuit shown in fig. 7(b), find the value of K so that the resistance of the combination is minimum. 5

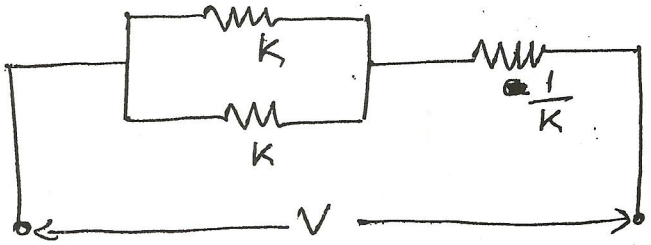

Fig. 7(b)

c) An unknown impedance of z Ω is connected in series with (5 + j8) Ω coil as shown in fig. 7(c). If I = 2-5 $\angle -15°$ A, find the value of z. 5

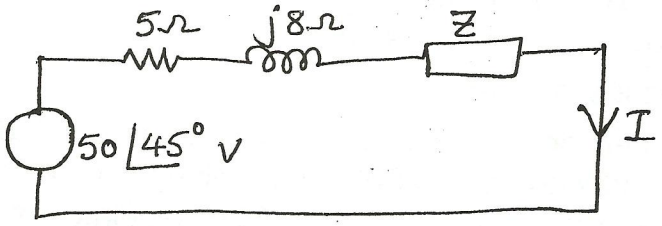

Fig. 7(c)

d) Derive the expression for voltage regulation in a single phase transformer. 5

8. a) Define the following terms :
i) Permeability ii) Lenz's law. 4

b) Find RXY in the circuit shown in fig. 8(b) 5

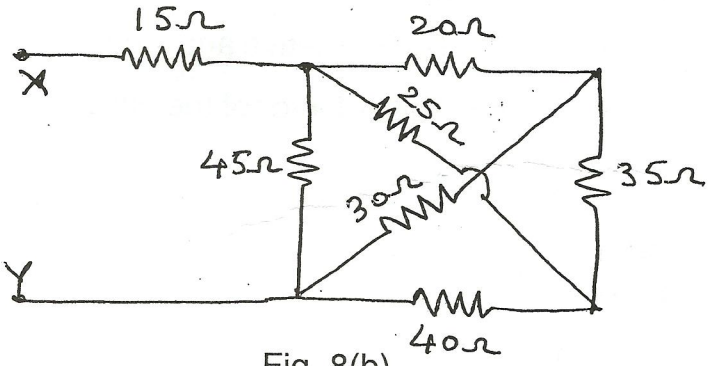

Fig. 8(b)

c) Derive an expression for current in series RC circuit excited from a sinusoidal source. Draw the phasor diagram. 6

d) How a three-phase power is measured using two Wattmeter method. 5