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SEM 1-4 (RC 2016-17)

F.E. Semester – I (RC 2016-17) Examination, Nov./Dec. 2016
FUNDAMENTALS OF ELECTRICAL ENGINEERING (New)

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 schematic/Block diagram the working of a thermal power plant. **8**

   b) Draw a single line diagram representing electrical power system. Write typical values of voltages at different levels. **7**

   c) When one coil of a magnetically coupled pair has a current 5A the resulting fluxes ϕ_{11} and ϕ_{12} are 0.2 mWb and 0.4mWb, respectively. If the turns are 500 and 1500, find L_1, L_2, M and coefficient of coupling K. **5**

2. a) Define the following terms :
      i) Ideal and practical current source
      ii) Planar circuits. **4**

   b) Using superposition theorem find the current i_y in the circuit of fig. 2(b)

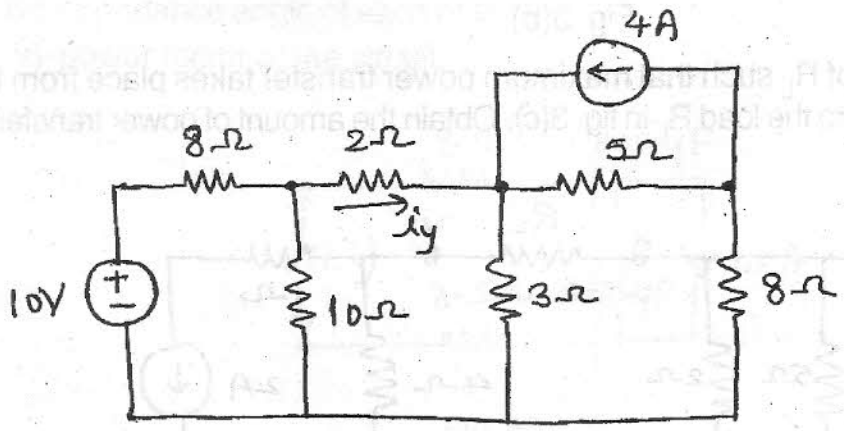

Fig.2(b) **8**

P.T.O.

c) Thevenize the bridge circuit across a – b in fig. 2(c). 8

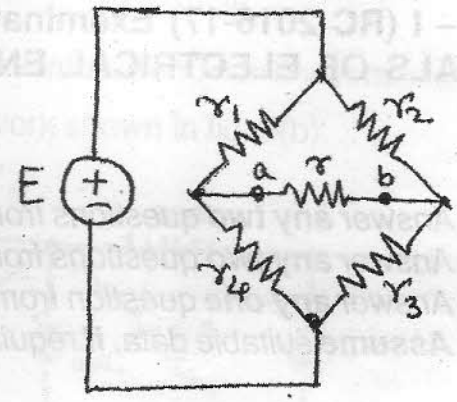

Fig.2(c)

3. a) State and explain Norton's theorem. 4

b) In the fig. 3(b), let $L_1 = 0.4$ H ; $L_2 = 2.5$ H ; K = 0.6 and $i_1 = 4$, $i_2 = 20 \cos (500\,t - 20°)$ mA. Evaluate the following quantities at t = 0.

1) i_2
2) v_1
3) The total energy stored in the system. 8

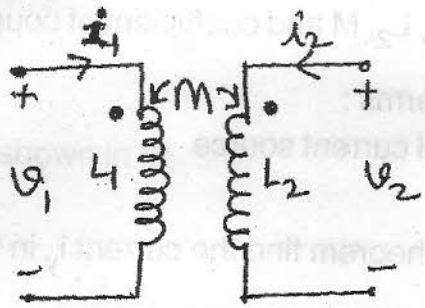

Fig. 3(b)

c) Find the value of R_L such that maximum power transfer takes place from the current sources to the load R_L in fig. 3(c). Obtain the amount of power transfer. 8

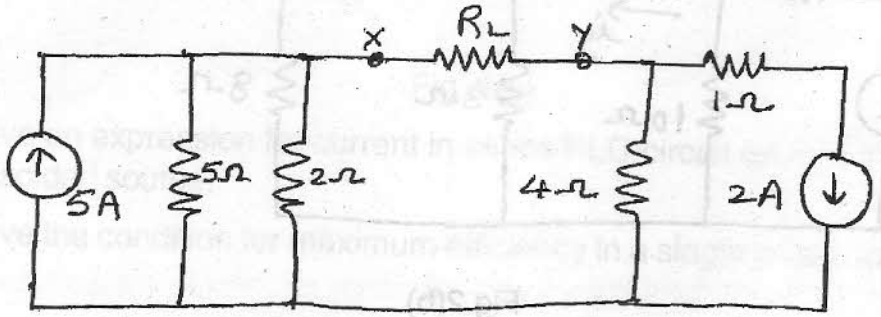

Fig. 3(c)

PART – B

4. a) Define the following terms :
   i) Average value
   ii) Form factor
   iii) Active power
   iv) Power factor. **8**

   b) A 4 ohm resistor is connected to a 10 mH inductor a 100 V, 50Hz voltage source. Find
   i) Power factor of the circuit
   ii) Total power supplied. **4**

   c) A 10Ω resistor is connected in parallel with a 100μF capacitor. Supply being 5A, 50 Hz current source, find the rms and instantaneous branch currents through the capacitor and resistor. **8**

5. a) Is three phase system preferred over single phase system ? Why ? **6**

   b) Explain the working of a single phase transformer. **6**

   c) Three similar coils, each having a resistance of 3Ω and an inductive reactance of 4Ω are connected in i) Y and ii) Δ, across a 400 V, three-phase supply. Calculate for each connection the readings on each of the two wattmeters connected to measure the power by the two-wattmeters method. **8**

6. a) In the circuit shown in fig. 6(a) if the supply frequency is 60 Hz, find :
   i) drop across each circuit element
   ii) total resistive and capacitive drop
   iii) supply voltage
   iv) impedance angle of each branch
   v) power factor of the circuit. **10**

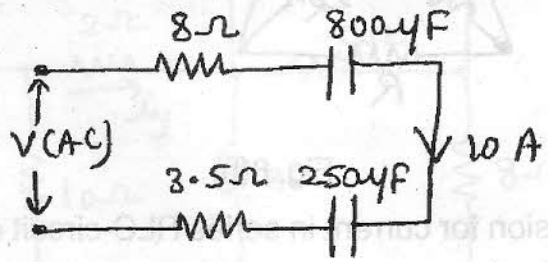

Fig. 6(a)

   b) Explain how the various losses and efficiency of a single phase transformer are measured/calculated without loading the transformer. **10**

PART – C

7. a) Differentiate between conventional and non conventional sources of energy. 5

   b) Find current I in the network shown in fig. 7(b). 5

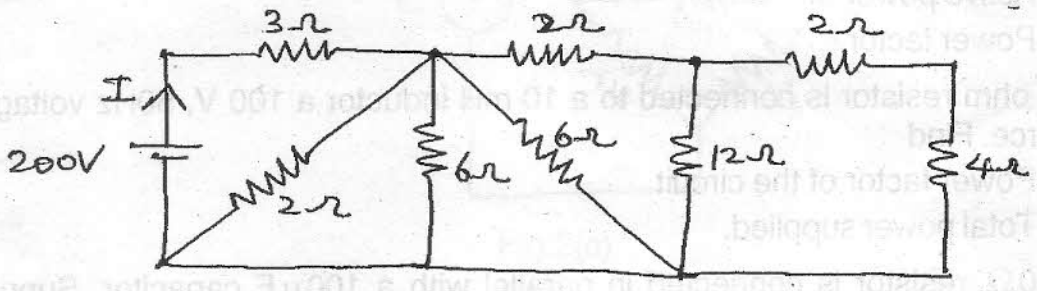

Fig. 7(b)

   c) A coil takes current of $1\angle 60^\circ$ A (lag) from 100 V, 60 Hz, supply. Calculate its inductances, resistance and impedance. 6

   d) Draw the equivalent circuit of a transformer. 4

8. a) Define the following terms :
      i) Reluctance
      ii) Ampere's law. 4

   b) Find R_{xy} in the circuit shown in fig. 8(b) 5

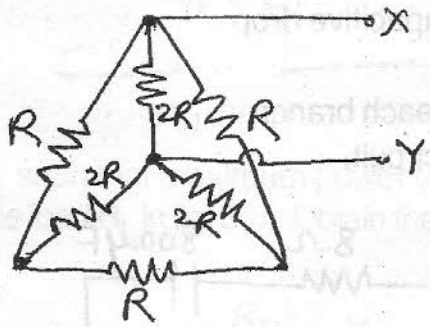

Fig. 8(b)

   c) Derive an expression for current in series RLC-circuit excited from a sinusoided source. 6

   d) Derive the condition for maximum efficiency in a single phase transformer. 5