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)

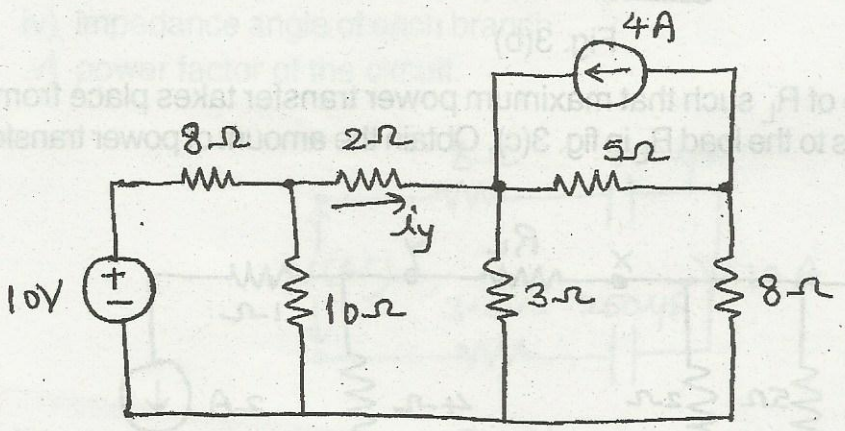

Fig.2(b) **8**

P.T.O.

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

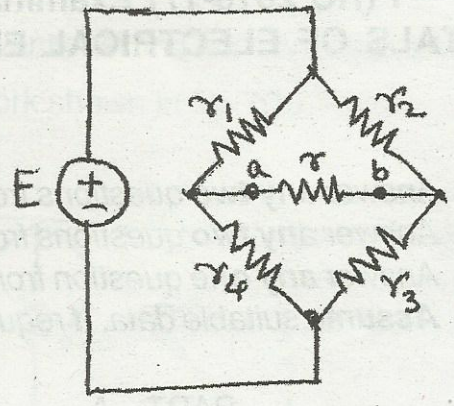

Fig.2(c)

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**

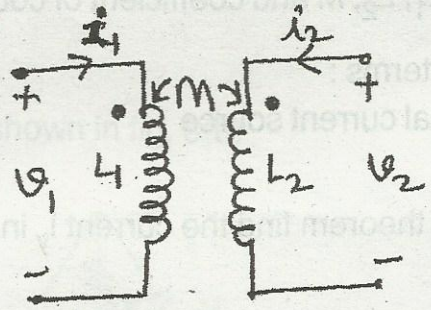

Fig. 3(b)

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**

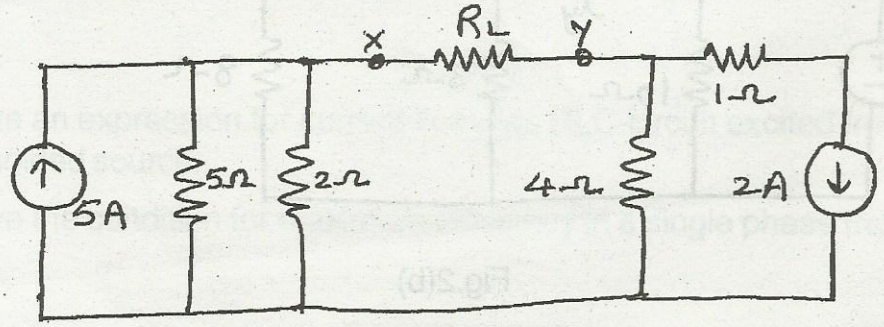

Fig. 3(c)

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

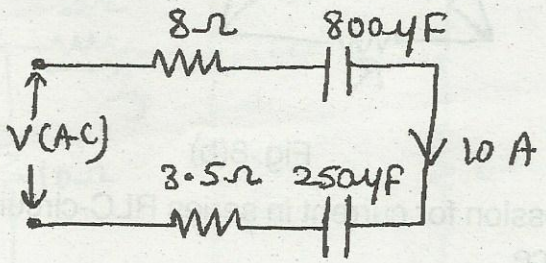

Fig. 6(a)

   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

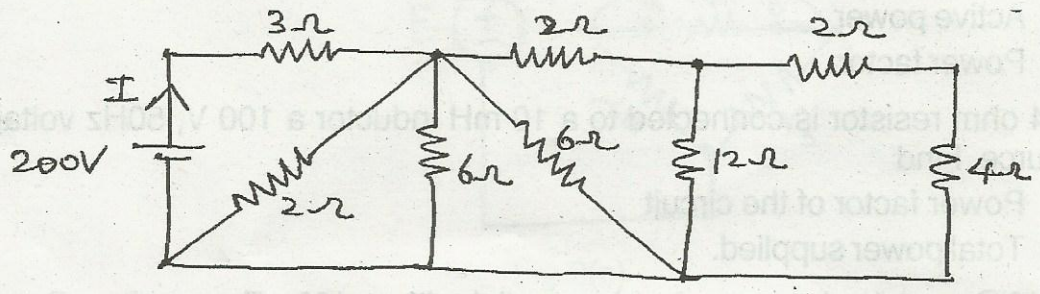

Fig. 7(b)

   c) A coil takes current of $1\angle 60°$ 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

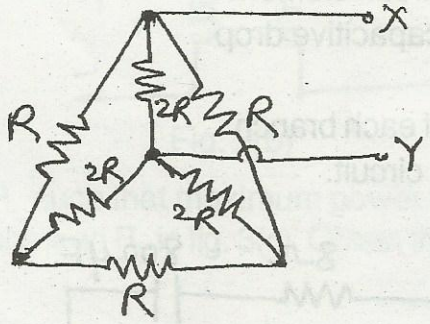

Fig. 8(b)

   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