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**F. E. Semester-I (Revised Course 2016-17)**  
**EXAMINATION OCTOBER 2016**  
**Fundamental of Electrical Engineering**

[Duration : Two Hours]

[Total Marks : 60]

**Instructions:**

- 1) Answer THREE FULL QUESTIONS with ONE QUESTION FROM EACH PART.
- 2) Assume suitable date, if required.

**PART- A**

1.
  - a) Explain with the help of a schematic/block diagram the working of a hydro power plant? 8
  - b) Describe in detail the working as wind power plants? 7
  - c) Two coupled coils have self inductances  $L_1 = 50\text{mH}$  and  $L_2 = 200\text{mH}$  and coefficient of coupling  $K = 0.5$ . If coil has 1000 turns and  $i_1 = 5 \sin 400t$  (A), find the voltage at coil 2 and the flux  $\phi_1$  5
2.
  - a) Define the following terms? 4
    - (i) Non Planar circuits.
    - (ii) Passive circuits.
  - b) Find the Thevenin equivalent of the network in big 2 (b) as viewed from terminals x and x' 8

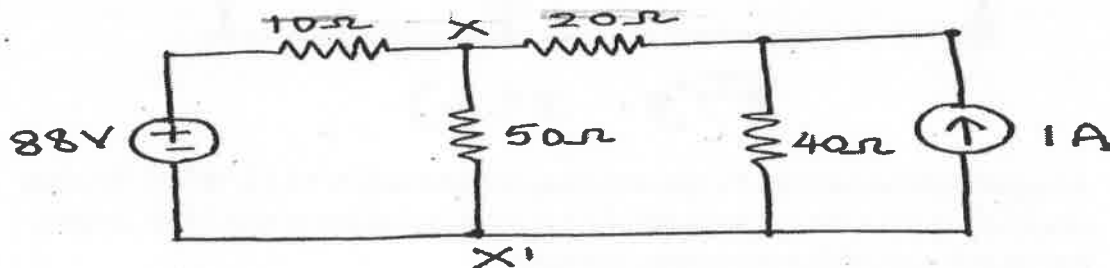
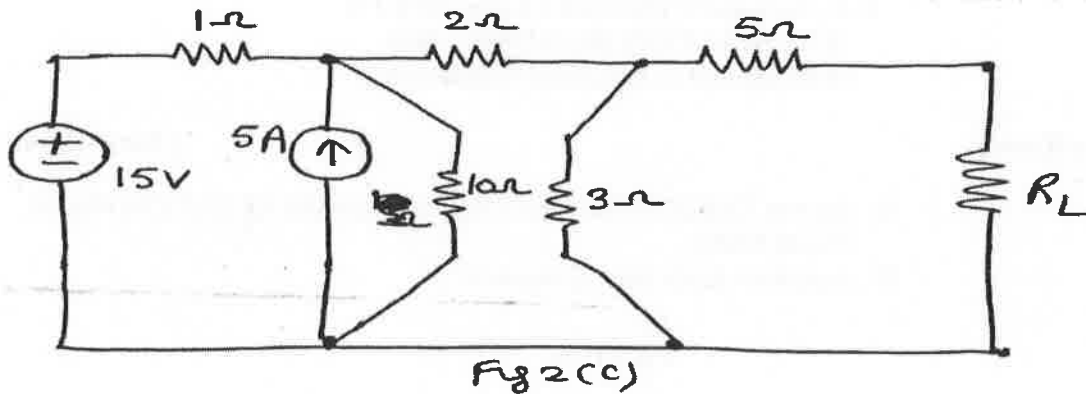
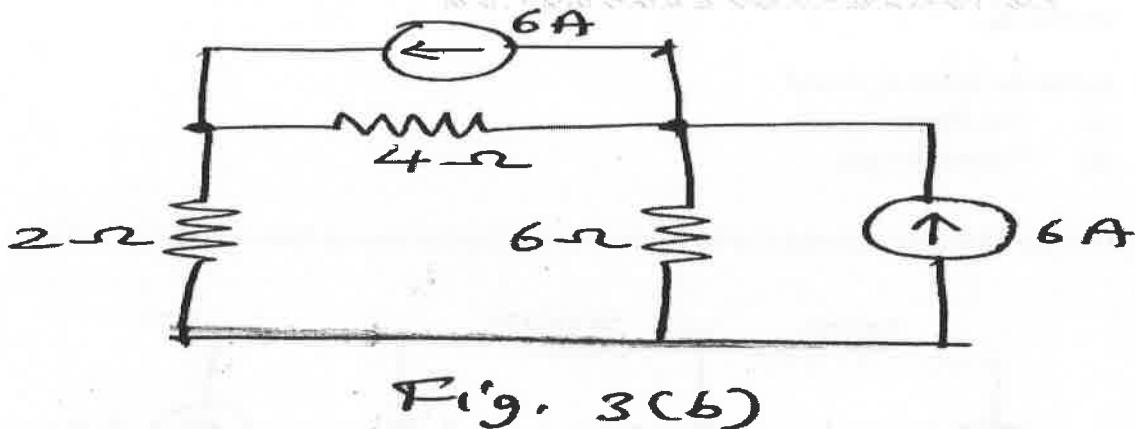


Fig 2(b)

- c) Find the value of load resistance  $R_L$  assuming maximum power transfer from the source to the load. What is the amount of this maximum power? 8



3. a) State and explain superposition theorem. 5  
b) Calculate the node voltages in the circuit shown in Fig 3(b) 7



- c) A magnetic circuit consists of a core with cross-sectional area  $A = 1.8 \times 10^{-3} \text{ m}^2$ , the mean core length of 0.6m, the air gap length of 2.5 mm and the number of turns of 90. Assume that the core is of infinite permeability Calculate 8  
(1) The reluctance of the core and that of the air gap.  
(2) For a current of 1.5 A, calculate the total flux.  
(3) Repeat (1) and (2) for  $\mu = 2000$

#### PART -B

4. a) Define the following terms 8  
(i) Time Period  
(ii) RMS Value  
(iii) Peak Factor  
(iv) Reactive Power  
b) A 4 ohm resistor is connected to a 10mH inductor across a 100v, 50Hz voltage requires.

- Find
- (i) Input current 4
  - (ii) Drop across the resistor and inductance
  - c) A R-L series circuit is in parallel with a resistance ( $R_2$ ) and the combination is connected across a  $10\text{Hz}$  ac source. The power delivered to the resistances is  $100\text{w}$ . Find the Value of inductance. 8
5. a) What is the significance of a phase sequence in a three phase system? Explain with the help of waveforms? 6
- b) Explain in detail the types of transformers based on construction. What type of material is used for the case and windings? 8
- c) A  $75\text{ kVA}$  single phase transformer has a step down ratio of  $12:1$ , with  $2400$  primary turns and primary voltage of  $3.3\text{ kv}$ . Calculate
- (i) The number of secondary turns
  - (ii) The secondary voltage
  - (iii) The volts per turn
  - (iv) The full load primary and secondary currents 6
6. a) Explain how the various losses in a single phase transformer are measured and hence the efficiency is calculated without loading the transformer 10
- b) A heater takes  $10\text{A}$  at  $50\text{v}$ . calculate the impedance of a choke of  $5\Omega$  resistance to be placed in series with the heater so that it may work at  $200\text{v}$ ,  $50\text{Hz}$  apply. Find also the power factor of the circuit? 10

### PART - C

7. a) Derive an expression for energy stored in a magnetic circuit? 5
- b) State and prove maximum power transfer theorem? 5
- c) Show the line and phase quantities relationship in star and delta connections? 4
- d) A voltage of  $230 \angle 45^\circ \text{ V}$ ,  $50\text{Hz}$  is applied across a RLC series circuit where the input current is  $10 \angle -30^\circ \text{ A}$ . If  $R=5\Omega$ ,  $X_L = j8\Omega$ , find the value of  $X_C$ ? 6
8. a) Define the following terms
- (i) Flux density
  - (ii) Faradays laws 4
- b) Find the equivalent resistance between terminals a-b of the network shown in big 8(b)? 5

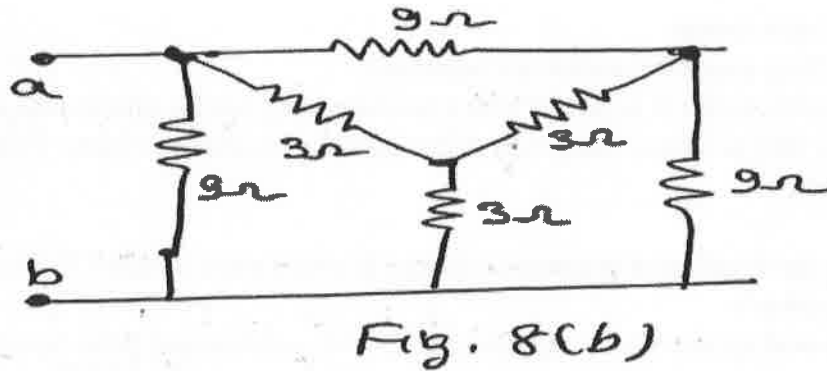


Fig. 8(b)

- |   |   |
|---|---|
| c) Drive an expression for current in series RL-circuit excited from a sinusoidal source. Draw the phase diagram. | 6 |
| d) Derive the condition for maximum efficiency in a single phase transformer?                                     | 5 |