



## SEM 1 – 5 (RC 16-17)

### F.E. (Semester – I) (RC 2016 – 17) Examination, May/June 2018 FUNDAMENTALS OF ELECTRICAL ENGINEERING

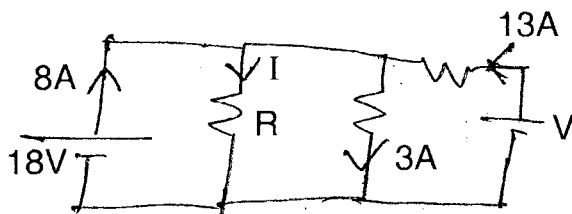
Duration : 3 Hours

Total Marks : 100

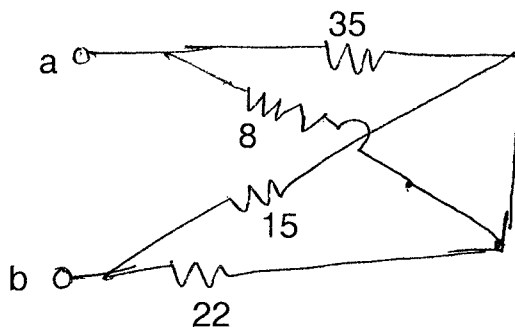
**Instructions :** 1) Answer **any two** from Part – A and **any two** from Part – B.  
2) Answer **any one** from Part – C.

#### PART – A

1. a) Explain with neat schematic the working of nuclear power plant. 8  
b) What do you mean by mutual inductance ? Derive its expression in terms of related parameters. 6  
c) Describe the analogy between an electric circuit and the magnetic circuit. 6
2. a) Find current  $I$  and value of resistance  $R$  if current distribution in the circuit below is as shown. Also find the value of voltage source  $V$ . (2+3+3)



- b) In the circuit below find the voltage that should be applied between a and b so that voltage drop of 45 V occurs across 15  $\Omega$  resistor. 8

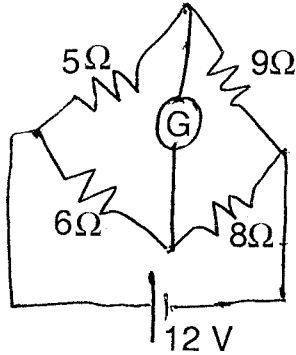


- c) Explain Kirchhoff's laws. 4

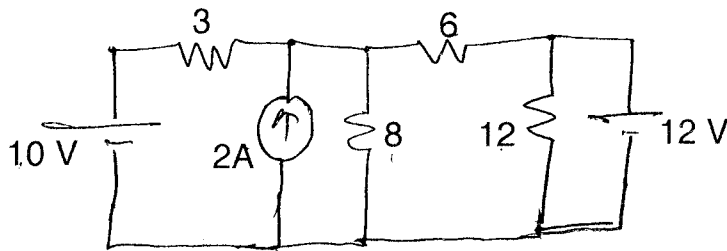
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3. a) State and explain Thevenin's theorem. 4
- b) Use Norton's theorem to find the current in the galvanometer G, in the Wheatstone's bridge below. The galvanometer resistance  $r_g = 2\Omega$ . 8

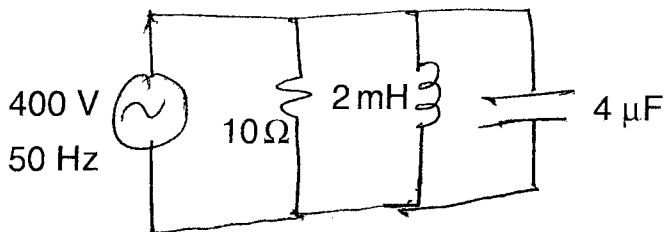


- c) Use nodal equations to find all branch current in the circuit below. 8



## PART – B

4. a) Derive emf equation in 1 $\phi$  transformer. 4
- b) With the help of neat circuit and phasor diagram show that 3 $\phi$  power can be measured using two wattmeters. 10
- c) Find branch currents and source current in the circuit below : 6





5. a) What do you mean by :

6

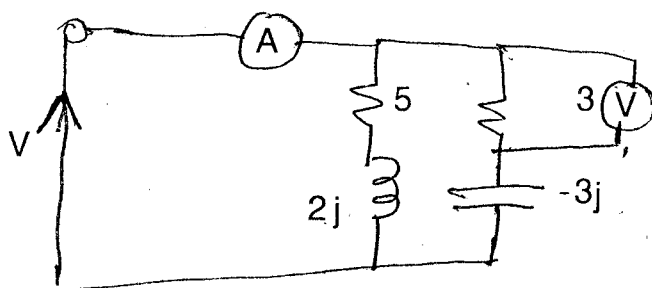
- 1) Lagging and leading power factor
- 2) Phase sequence
- 3) RMS value.

b) A  $3\phi$  balanced load of  $6 + 8j$  is connected in star across balanced  $3\phi$  440 V, 50 Hz supply. Find line currents and total power dissipated in the load.

6

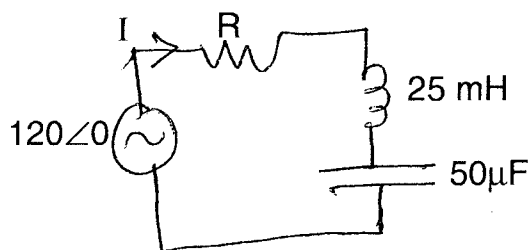
c) In the circuit below if the voltmeter reads 45 V across  $3\Omega$ , what is the indication on the ammeter ? Also find voltage V.

8



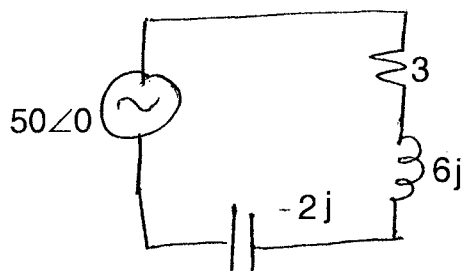
6. a) In the circuit below at frequency  $\omega = 400$  rad/sec, the current leads the voltage by  $63.4^\circ$ . Find R and voltage across each circuit element. Draw voltage phasor diagram.

6



b) Draw the power triangle for the circuit below :

6



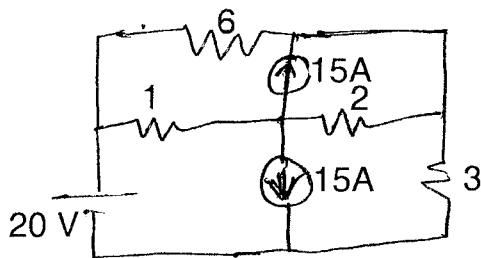
c) With neat circuit diagrams explain OC and SC tests done on  $1\phi$  transformer. Also explain how the test results are put to use.

8

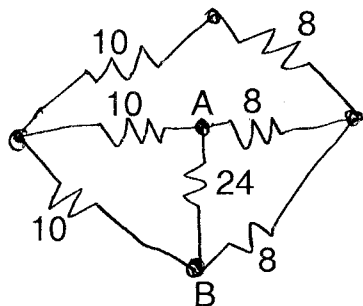


## PART – C

7. a) Derive expression for current growth in inductor when it is connected to voltage  $E$  through resistor  $R$ . 8
- b) What is the unit of power rating of transformer. What it signifies ? 4
- c) Use superposition principle to find current in  $2\Omega$  resistor in circuit below. 8



8. a) Determine the equivalent resistance between points A and B of the network below. 6



- b) A network draws 10 KW power at 0.8 pf lag at voltage of 220 V. Determine the current drawn and KVAR and KVA of the network. 8
- c) State and prove maximum power transfer theorem for dc circuit. 6