

## SEM 1 – 4 (RC 16-17)

### F.E. (Semester – I) (Revised In 2016-17) Examination, Nov./Dec. 2017 FUNDAMENTALS OF ELECTRICAL ENGINEERING

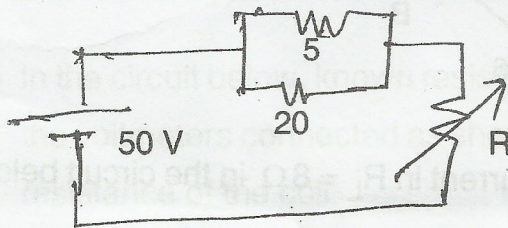
Duration : 3 Hours

Total Marks : 100

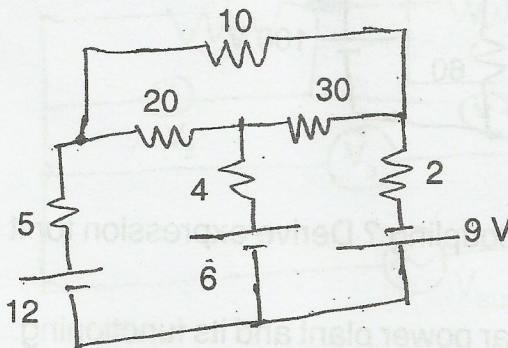
- Instructions :** 1) Answer **any two** questions from **each** of Part – A and Part – B  
(Total 4 questions).  
2) Answer **any one** question from Part – C.

#### PART – A

1. a) To what value is the adjustable resistor R set if the power in  $5\Omega$  resistor is 20 Watts, in following circuit. 6



- b) Write and solve loop equations to find all the branch currents, in circuit below. 6



- c) Derive expression for voltage build up across the capacitor connected to battery E volt, through resistor R. 8

2. a) Compare an electrical circuit with magnetic circuit. 6

- b) Three inductors are arranged as shown. Find

- 1) Equivalent inductance. 2

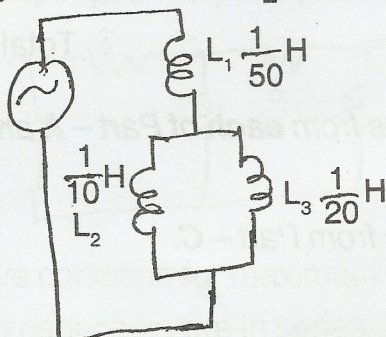
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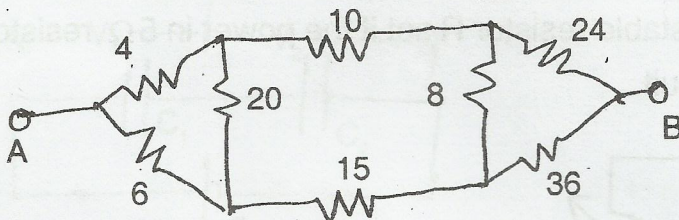
- 2) If the current in coil  $L_1$  is changing at a rate of  $1500 \text{ A/S}$ , find the emf generated in coil  $L_2$ .

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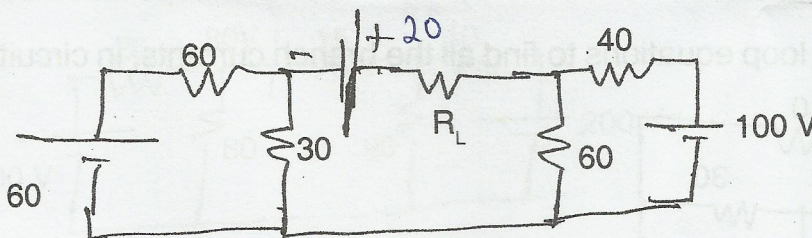
- c) Find the equivalent resistance  $R_{AB}$ .

6



3. a) Use Thevenin's theorem to find the current in  $R_L = 8\Omega$  in the circuit below.

8



- b) What do you mean by coefficient of coupling? Derive expression for it in terms of self inductance.

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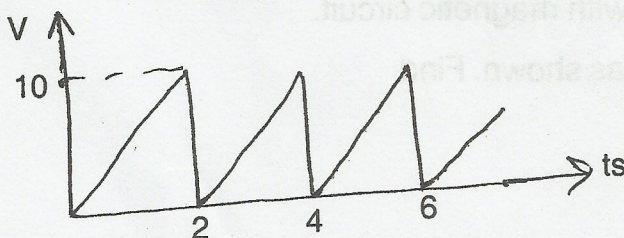
- c) Describe in detail components of solar power plant and its functioning.

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### PART – B

4. a) Find the average and RMS value of the voltage waveform below.

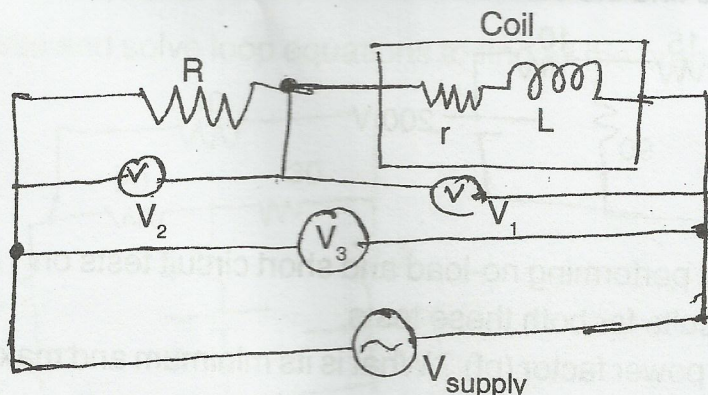
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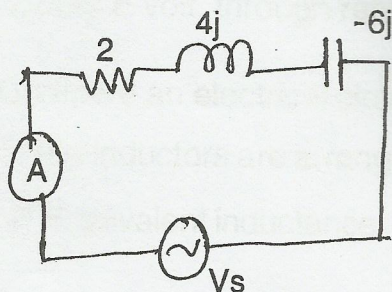




- b) A series circuit has current  $i = 4 \cos (2000 t + 13.2^\circ)$  when voltage  $V = 200 \sin (2000 t + 50^\circ)$  is applied to it. Find the circuit elements. 8
- c) If no-load current of 440 V/110 V transformer is 2A at 0.2 pf lag, what is the primary current when it supplies 120 A at 0.8 pf lag on the secondary. 6
5. a) Show that the line voltage is  $\sqrt{3}$  times phase voltage in star connected balanced  $3\phi$  system. Draw neat phasor diagram. 5
- b) Explain with neat phasor diagram two wattmeter method of power measurement in balanced  $3\phi$  system. Draw neat circuit diagram. 10
- c) If voltage and current in a circuit is  $V = 8 + 10j$  and  $I = 3 - 4j$ . Find the active and reactive power drawn by the circuit. 5
6. a) In the circuit below, known resistance  $R$  is in series with a coil. If readings of the voltmeters connected as shown are  $V_1$ ,  $V_2$  and  $V_3$ . Find inductance and resistance of the coil. 10



- b) In the circuit below the current measured by the ammeter is 5A. Find the voltage across each element and the supply voltage. Draw phasor diagram. 6



- c) How is rating of transformer specified? Explain its significance. 4

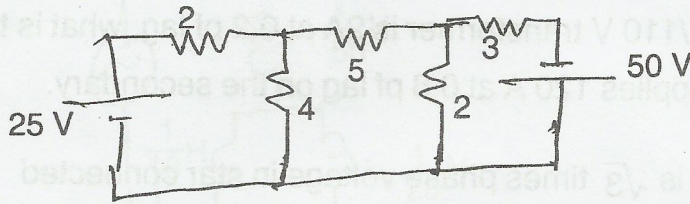




## PART – C

7. a) Use super position principle to find current in branch containing  $5\Omega$ .

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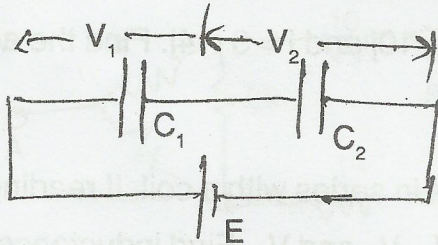


- b) Derive condition for maximum efficiency of an 1  $\phi$  transformer.

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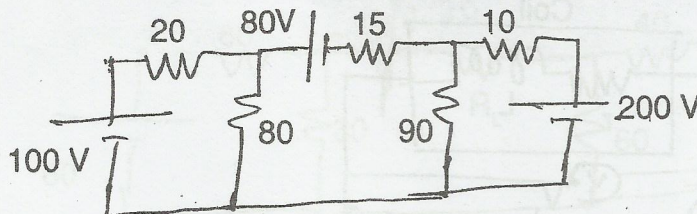
- c) If two capacitors are in series. Derive expression for voltage across each of them if voltage across the series is  $E$ , as shown.

5



8. a) Use nodal equations to find the current in all branches of circuit below.

6



- b) What is the purpose of performing no-load and short circuit tests on 1  $\phi$  transformer. Draw circuits for both these tests.

8

- c) What do you mean by power factor (pf) ? What is its minimum and maximum value ? What is pf of

6

1) Pure resistance.

2) Pure inductance.

3) Pure capacitance ?

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