

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

Duration : 3 Hours

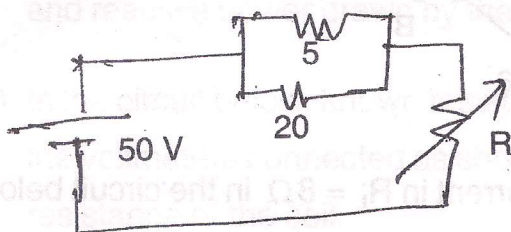
Total Marks : 100

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

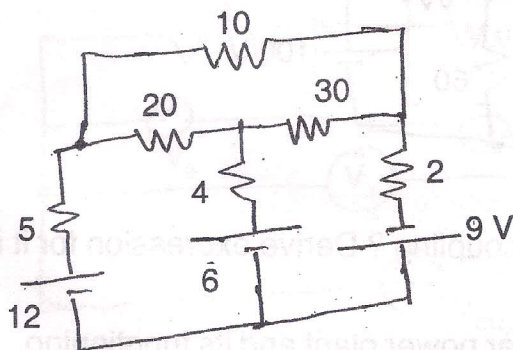
2) Answer **any one** question from Part – C.

PART – A

1. a) To what value is the adjustable resistor R set if the power in 5Ω 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

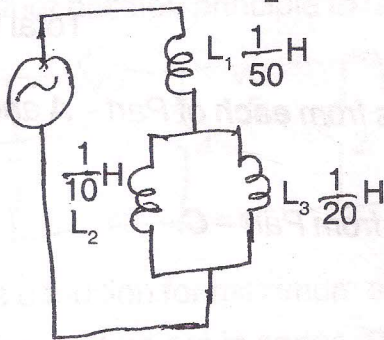
1) Equivalent inductance. 2

P.T.O.



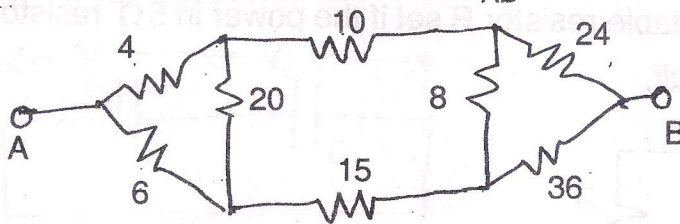
- 2) If the current in coil L_1 is changing at a rate of 1500 A/S , find the emf generated in coil L_2 .

6



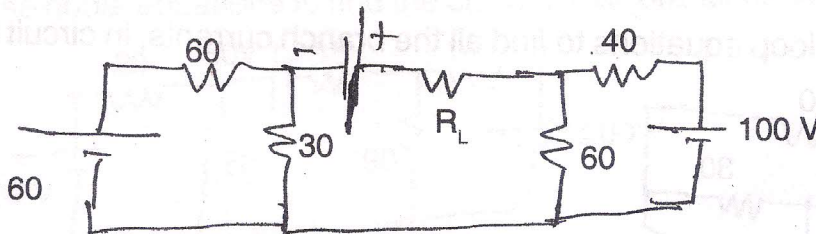
- c) Find the equivalent resistance R_{AB} .

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

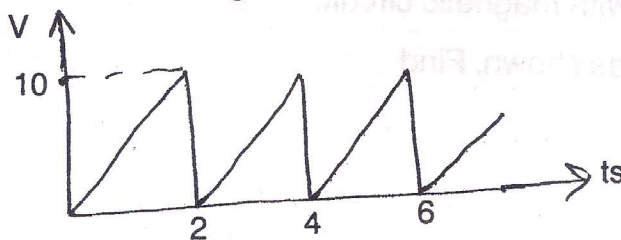
6

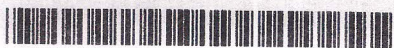
6

PART – B

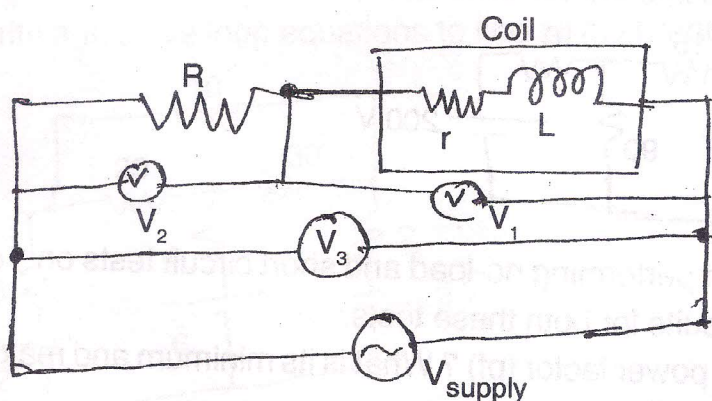
4. a) Find the average and RMS value of the voltage waveform below.

6

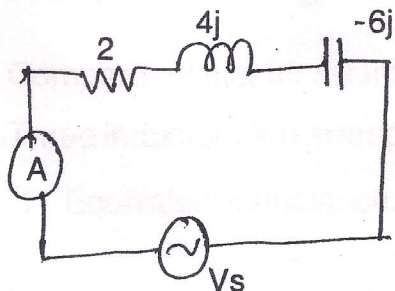




- b) A series circuit has current $i = 4 \cos (2000 t + 13.2^\circ)$ when voltage $V = 200 \sin (2000 t + 50^\circ)$ is applied to it. Find the circuit elements. 8
- c) If no-load current of 440 V/110 V transformer is 2A at 0.2 pf lag, what is the primary current when it supplies 120 A at 0.8 pf lag on the secondary. 6
5. a) Show that the line voltage is $\sqrt{3}$ times phase voltage in star connected balanced 3ϕ system. Draw neat phasor diagram. 5
- b) Explain with neat phasor diagram two wattmeter method of power measurement in balanced 3ϕ 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



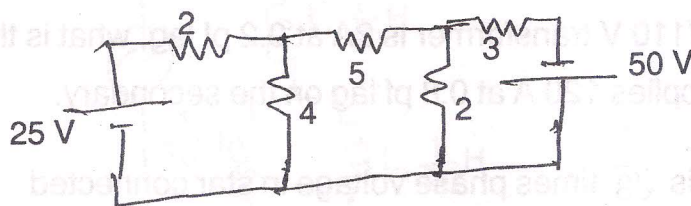
- c) How is rating of transformer specified ? Explain its significance. 4



PART – C

7. a) Use super position principle to find current in branch containing 5Ω .

8

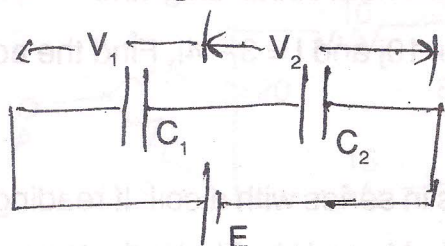


- b) Derive condition for maximum efficiency of an 1ϕ transformer.

7

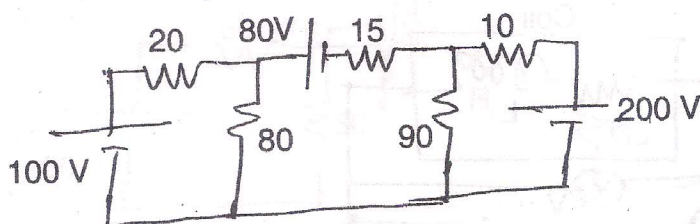
- c) If two capacitors are in series. Derive expression for voltage across each of them if voltage across the series is E , as shown.

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 1ϕ 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?
