



## Basic Electrical And Electronics Engineering - May 17

First Year Engineering (Semester 1)

**Total marks: 80**

**Total time: 3 Hours**

### INSTRUCTIONS

(1) Question 1 is compulsory.

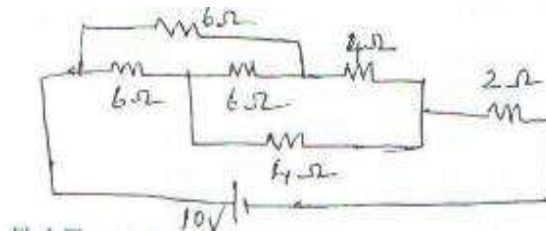
(2) Attempt any **three** from the remaining questions.

(3) Draw neat diagrams wherever necessary.

Q1 Attempt any 5

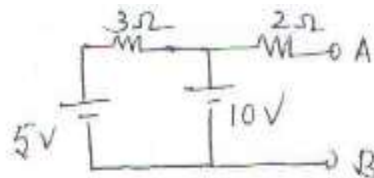
1.a. Find current through  $2\Omega$  resistor using star delta transformation

(3 marks)



1.b. Find Thevenin's equivalent circuit across AB.

(3 marks)



1.c. An alternating voltage is represented by  $v=141.4 \sin 377t$ , find frequency, time period and time at which voltage is 100V for the first time.

(3 marks)

1.d. Prove that for a pure capacitor average power drawn over one complete cycle is zero. (3 marks)

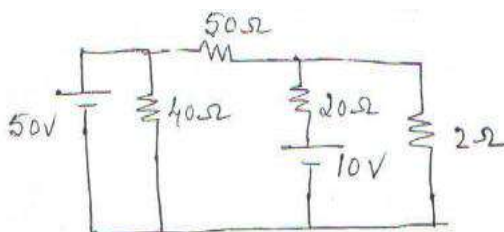
1.e. Draw a three phase delta connected load connected across a three phase supply, mark phase voltage, phase current, line voltage and line current. (2 marks)

1.f. Derive the induced emf equation of a single phase transformer. (4 marks)

1.g. Draw the input and output voltage waveform of a half wave rectifier. (2 marks)



2.a. Using Mesh analysis find current through  $2\ \Omega$  resistor (6 marks)



2.b. A choke coil of  $10\ \Omega$  resistance and  $0.1\ \text{H}$  inductance is connected in series with a capacitor of  $200\ \mu\text{F}$  across  $230\ \text{V}$ ,  $50\ \text{Hz}$  supply. Calculate circuit impedance current, power factor, power dissipated in the coil and voltage across coil. (8 marks)

2.c. Draw phasor diagram of a single phase transformer connected to a resistive load. (6 marks)

3.a. Three identical impedance are connected in star to a three phase supply of  $400\ \text{V}$ . The line current is  $30\ \text{A}$  and total power taken from the supply is  $14\ \text{kW}$ . Calculate resistance and reactance value of each impedance. (8 marks)

3.b. Open circuit and short circuit test on a  $5\ \text{kVA}$ ,  $200/400\ \text{V}$ ,  $50\ \text{Hz}$  single phase transformer gave the following test results.

open circuit test (L.V side ):  $200\ \text{V}$ ,  $1\ \text{A}$ ,  $100\ \text{W}$

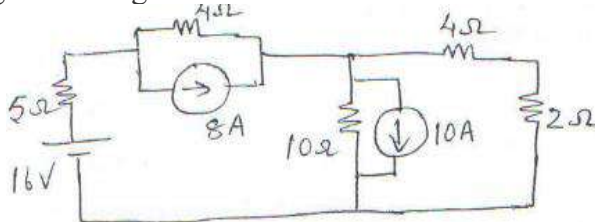
Short circuit test (With primary short circuited)  $15\ \text{V}$ ,  $10\ \text{A}$ ,  $85\ \text{W}$ .

Find the equivalent circuit parameters and draw it referred to primary side. (6 marks)

3.c. Illustrate with the output characteristics the active region, saturation region and cut off region of CE transistor configuration. (4 marks)

3.d. Compare the performance of capacitor filter with inductor filter. (2 marks)

4.a. Find current through  $2\ \Omega$  using transformation. (7 marks)



4.b. Two wattmeter are connected to measure power in a three phase circuit. The reading of one wattmeter is  $7\ \text{kW}$  when the load power factor is unity. If power factor of load is changed to  $0.707$  lagging without changing the total input power, calculate the reading of two wattmeters.



(4 marks)

4.c. Find expression for sum of 3 voltages in instantaneous form where

$$V_1 = 6\sin(\omega t + 35^\circ)$$

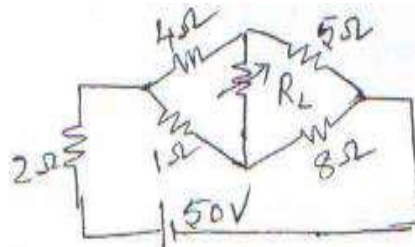
$$V_2 = 5\sin(\omega t - 150^\circ)$$

$$V_3 = 6\cos(\omega t + 40^\circ)$$

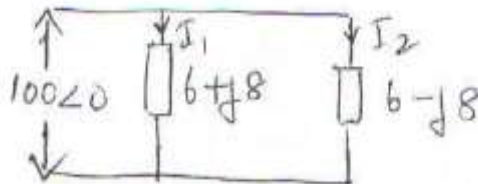
(5 marks)

4.d. With neat circuit diagram explain the working of a full wave bridge rectifier. Draw output voltage and current waveform. (4 marks)

5.a. Find value of  $R_L$  for which maximum power get dissipated and also calculate maximum power. (8 marks)

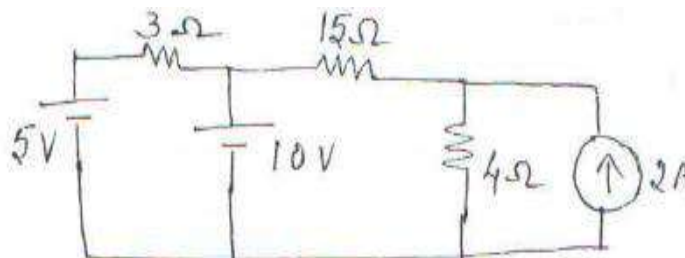


5.b. Find currents through each branch (4 marks)



5.c. Develop complete equivalent circuit of single phase transformer. (8 marks)

6.a. Find current through 15 ohm resistor using superposition theorem.



(7 marks)



**6.b.** An R-L-C series circuit with a resistance of  $10\Omega$ , inductance of  $0.2\text{ H}$  and a capacitance of  $40\mu\text{F}$  is supplied with a  $100\text{V}$  supply at variable frequency. Find following with respects to series resonance circuit.

1. The frequency at which resonance takes place

2. Current at resonance

3. Power and power factor

4. Q-factor

(7 marks)

**6.c.** Derive power and power factor in a balanced three phase star connected circuit under two watt meters measurements in terms of wattmeter reading. Draw relevant connections and phasor diagram.

(6 marks)