BACHELOR OF CHEMICAL ENGINEERING, 2017

(1st Year, 2nd Semester)

ELECTRICAL TECHNOLOGY

Time: Three Hours | Full Marks: 100

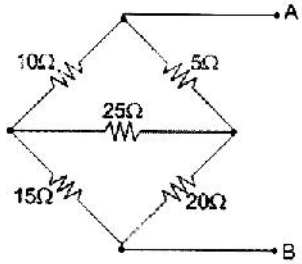
(50 marks for each part)

Use a separate Answer-script for each Part

PART-I

Answer Question No. 1 ***any two*** from the rest

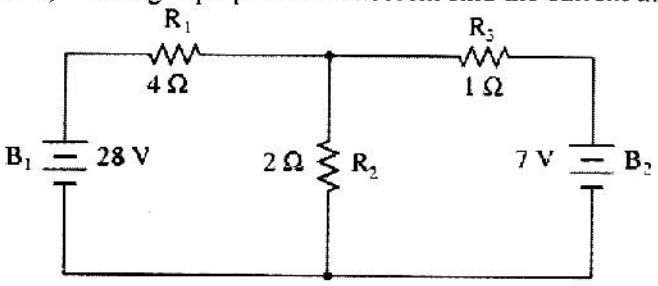
1. a) If a 100 V source is now connected across the terminals A and B, determine the current through 25 Ω resistor using Thevenin's Theorem. 9



b) Explain the similarities and dissimilarities between electric and magnetic circuit. 5

c) Derive the relationship between the alternating voltage and current for a purely inductive circuit. Also show the average power consumed by the circuit under alternating excitation is zero. Draw the phasor diagram between voltage and current. 6

2. a) Using superposition Theorem find the current through 2 Ω resistor. 5



b) State and prove maximum power transfer theorem. 5

c) Explain true power and apparent power in alternating (ac) circuits. 5

3. a) Explain the phenomenon of resonance in a series R-L-C circuit and parallel R-L-C circuit. 3+3

b) A series RLC circuit containing a resistance of 12 Ω, an inductance of 0.15 H and a capacitor of 100 μF are connected in series across a 100V, 50Hz supply. Calculate the total circuit impedance, the circuit current, power factor and draw the voltage phasor diagram. 9

4. a) A mild steel ring of 30 cm mean circumference has a cross sectional area of 6 cm^2 and has a winding of 500 turns on it. The ring is cut through at a point so as to provide an air-gap of 1mm in the magnetic circuit. It is found that a current of 4 A in the winding produces a flux density of 1T in the air-gap. Find the relative permeability of steel and the inductance of the winding. 7

b) Draw the hysteresis loop for a ferromagnetic material subjected to sinusoidal excitation. What is the significance of the area enclosed by a B-H loop? 5

c) Explain eddy current loss. How it can be minimized? 3

5. Write short notes on 7.5*2=15
   a) 3 phase power measurement using two-wattmeter method.
   b) Star and Delta connections in three phase circuits.

Ex/CHE/ETECH/EE/T/B/2017

BACHELOR OF ENGINEERING IN CHEMICAL ENGINEERING EXAMINATION, 2017

(1st Year, 2nd Semester)

ELECTRICAL TECHNOLOGY

Time: Three hours Full Marks: 100

(50 marks for each Part)

Use a separate Answer-Script for each Part

PART- II

Answer ***any three*** questions.

Two marks are reserved for neatness and well organized answers.

1. (a) Discuss the principle of operation of a transformer. Consider suitable assumptions.
   (b) Draw and explain the no-load phasor diagram of a single phase transformer.
   (c) Prove that, the VA ratings of the two sides of a single phase two winding transformer are equal. (5+6+5)

2. (a) What do you understand by the terms "air gap power"? Show that for an induction machine, air gap power : ohmic loss : mechanical input power = 1: s: (1-s)
   b) Discuss how torque is produced by an induction motor. (8+8)

3. a) What are the types of transformer by their core construction? Discuss their advantages and disadvantages.
   b) What are the types of power losses occurring in a transformer? Discuss have can they be taken into account in the equivalent circuit of a single phase transformer.
   c) A 20 KVA, 2500/250 V, 50 Hz single phase transformer has following parameters:
   $R2 = 0.06\Omega$, $X2 = 0.08$, $R1 = 0.5\Omega$, $X1 = 0.7\Omega$
   Draw the equivalent circuit of the transformer referred to the low voltage side. Mention the values of the parameters. Use suitable assumptions. (4+6+6)

[Turn over

4. (a) Classify DC machines by the type of excitation. Draw equivalent circuit in all cases.
   (b) What are the conditions for proper voltage build-up in DC self-excited generators?
   (8+8)

5. (a) Discuss about the load characteristics of a DC shunt generator.
   (b) A 6-pole wave wound dc generator has 500 conductors. The speed of the machine is 400 rpm and resistance of each conductor is 0.02Ω. The flux per pole of the machine is 0.05 Wb. Find (i) the emf across the generator terminals (ii) the resistance of armature winding (iii) Opposing torque produced by the generator, when a load draws a current of 10A. (8+8)