25

Ex/PROD/ETECH/EE/T/112/2017(S)

BACHELOR OF ENGINEERING IN

PRODUCTION ENGINEERING EXAMINATION, 2017

(1st Year, 1st Semester, Supplementary)

ELECTRICAL TECHNOLOGY

Time: Three Hours | Full Marks: 100

(50 marks for each part)

Use a separate Answer-script for each Part

PART-I

Answer ***any three*** questions

Two marks are reserved for neat and well organized answer script

1. a) Give the similarities and differences between an electric and a magnetic circuit. What do you understand by the term leakage coefficient? 8

b) Explain Thevenin's Theorem. With the help of Thevenin's Theorem, find the current through the 20Ω resistor as shown in Fig. 1. 8

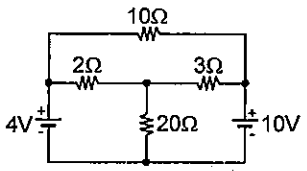

Fig. 1.

2. a) Find the currents I_1, I_2 and I_3 in Fig. 2 using Matrix equation. 8

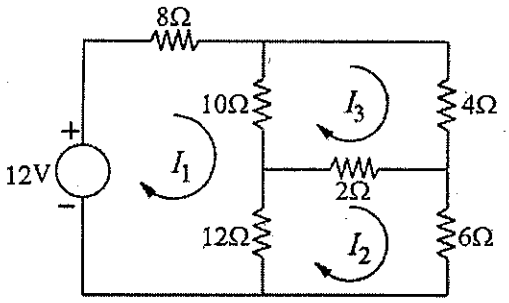

Fig. 2.

b) State and prove maximum power transfer theorem. 8

P.T.O.

3. a) In the following circuit (Fig. 3), for what value of R, maximum power will be delivered? Calculate the maximum power. 8

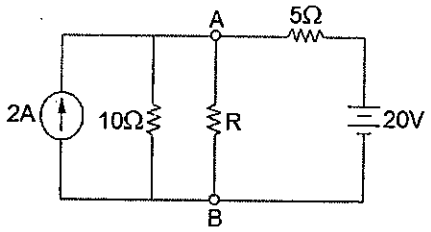

Fig. 3.

b) Find the value of total resistance between the nodes **A** and **B** of the circuit given in Fig. 4. 8

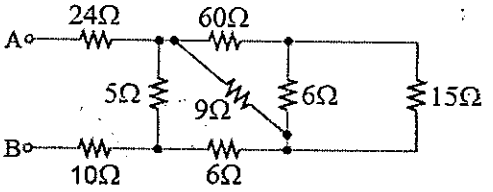

Fig. 4.

4. a) A ring has a mean diameter of 20 cm and a cross sectional area of 8 cm^2. The ring is made up of semicircular section of cast iron and cast steel, with each joint having an air gap of 0.1 mm. Find the ampere turns required to produce a flux of 10×10^{-4} Wb in the ring. The relative permeabilities of cast steel and cast iron are 800 and 166 respectively. Neglect magnetic leakage and fringing. 8

b) In a three phase circuit under balanced load condition, describe how the total power can be measured with the help of two wattmeters. Give necessary phasor diagrams. 8

5. a) A series R-L-C circuit consists of resistance R = 1kΩ, inductance L = 900mH and capacitance C = 2.2 μF. If the applied voltage be $230V_{rms}$ at 50 Hz, determine the current and voltage drops across R, L and C. Draw the necessary phasor diagrams. 8

b) A balanced 3 phase star connected load of (3+j6) Ω per phase is given a balanced 3 phase supply of 415 V, 50Hz. Find the (i) total active and reactive power consumed and (ii) line and phase currents. Give necessary phasor diagrams. 8

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Ex/PROD/ETECH/EE/T/112/2017 (S)

B.PROD. ENGG FIRST YEAR FIRST SEMESTER SUPPLEMENTARY EXAM - 2017

ELECTRICAL TECHNOLOGY

Time: Three hours | (50 marks for each Part) | Full Marks: 100

Use a separate Answer-Script for each Part

PART- II

Answer question no. 1 and *any two* from the rest of the questions

Two marks are reserved for neatness and well organized answers.

1. Discuss the functions of the following items (any four):
   (a) breather of a transformer
   (b) yoke of an induction machine
   (c) interpoles of a DC machine
   (d) commutator of a DC machine
   (e) conservator of a transformer

(4x 2)

2. (a) Distinguish between different types of transformers depending on the core construction.
   (b) Explain what will happen if a transformer is connected to a DC supply.
   (c) A 20 KVA, 2500/250 V, 50 Hz single phase transformer gave the following test results:
   Open circuit test: 250 V, 1.4 A, 105 W
   Short circuit test: 104 V, 8 A, 320 W
   Compute the parameters of the approximate equivalent circuit referred to the low voltage side. Also draw the approximate equivalent circuit referred to the low voltage side.

(6+4+10)

3. (a) Explain different types of starters used in Induction motor.
   (b) Draw the torque speed characteristic of a three phase induction motor.
   (c) A 4 pole, 50Hz induction machine rotates at 4% slip. Calculate the speed of the rotor. Also calculate the frequency of the rotor e.m.f.

(10+4+6)

4. (a) With a neat sketch, draw the essential parts of a DC generator. Label the parts.

   (b) Derive the e.m.f equation of a DC generator.

   (c) Explain the principle of operation of a three phase induction motor. (10+5+5)

5. Write short notes on:

   (a) Polarity test of a transformer

   (b) Characteristics of separately excited dc generators (10 x 2)