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B TECH

(SEM-II) THEORY EXAMINATION, 2018-19

BASIC ELECTRICAL ENGINEERING

Time: 3 Hours *Total Marks: 70*

Note: Attempt all Sections. If you require any missing data, chose suitably.

SECTION-A

1. Attempt *all* questions in brief. (2 x 7 = 14)
   a. Define ideal voltage and current sources.
   b. Define form factor and peak factor.
   c. Why is scale of a moving iron instrument nonlinear?
   d. Large ampere-turns are needed to create flux in the air gap as compared to steel, why?
   e. State Maximum power transfer theorem for ac networks.
   f. In two wattmeter method of power measurement in three phase circuit the readings of both wattmeters are equal. Find the power factor.
   g. What will happen, if the field winding of a running dc shunt motor suddenly opens?

SECTION-B

2. Attempt any *three* of the following: (7 x 3 = 21)
   a. Derive relation for delta to star transformation. Also, Use source transformation method to compute the current through 6 ohm resistor of Fig. 1.

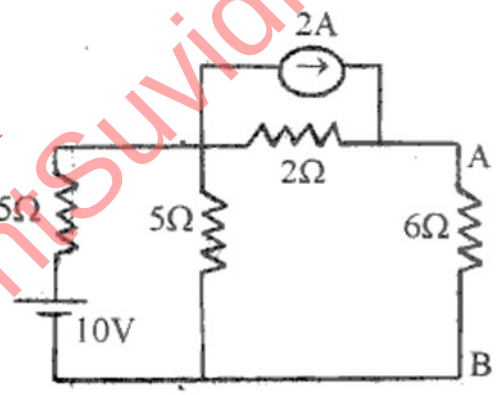

Fig. 1

   b. What is resonance? Derive the quality factor of the series RLC circuit at resonance.
   c. Explain Two-wattmeter method to determine power in 3-phase system.
   d. List the various losses occurring in transformer and write the condition of maximum efficiency. In a 25 kVA, 2000/200V the iron and copper losses are 200W and 400 W respectively. Calculate the efficiency at half load and 0.8 pf lagging. Determine also the maximum efficiency and the corresponding load.
   e. Why is the synchronous motor not self starting? Explain the advantages and disadvantages along with application of Synchronous motor.

SECTION-C

3. Attempt any *one* part of the following: (7 x 1 = 7)
   a. State and derive the maximum power transfer theorem for DC resistive circuits. Also derive the value of efficiency at the time of maximum power transfer.

b. State Norton's theorem. Using Thevenin's theorem find current in 5 ohm resistance of the circuit shown in Fig.2.

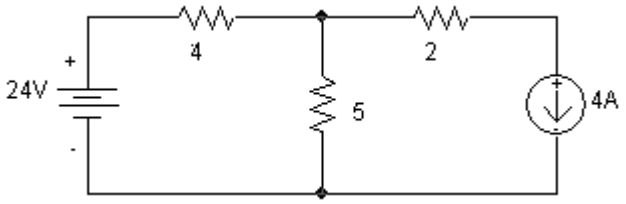

Fig. 2

4. Attempt any *one* part of the following: (7 x 1 = 7)

a. Define power factor. What are the causes and disadvantages of low power factor? Explain the method of power factor improvement.

b. Refer to the circuit shown in Fig.3. Find (a) rms line current (b) power dissipated in each branch (c) power factor (d) reactive power in each branch (e) total apparent power.

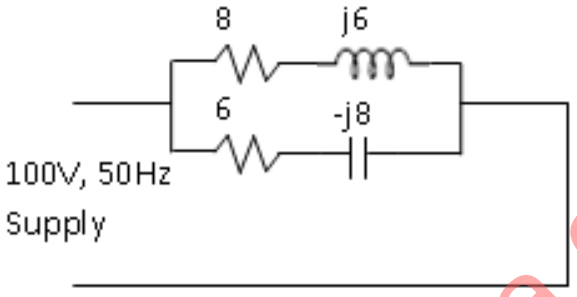

Fig. 3

5. Attempt any *one* part of the following: (7 x 1 = 7)

a. What is the necessity and advantage of 3-phase system? Derive $V_L=\sqrt{3}V_{ph}$ for star connected System.

b. Explain the construction and working of electrodynamometer type wattmeter. A moving coil instrument gives a full scale deflection of 10mA when a potential difference of 10mV is applied across the terminal; show how you will use the instrument to measure voltage up to 500V.

6. Attempt any *one* part of the following: (7 x 1 = 7)

a. Describe the analogies between electric and magnetic circuits.

b. Draw and explain the equivalent circuit of transformer. A 100kVA, 2,400/240V, 50Hz, single phase transformer has the following parameters-Primary winding (hv side): resistance $r_1 = 2.4\Omega$, leakage resistance $X_1 = 6.0\Omega$. Secondary winding (lv side): resistance $r_2 = 0.03\Omega$, leakage resistance $X_2 = 0.07\Omega$. Find the equivalent resistance & leakage reactance referred to secondary.

7. Attempt any *one* part of the following: (7 x 1 = 7)

a. Derive expression for generated emf in dc machines. Explain the term back emf when applied to dc motor. Briefly explain what role back emf plays in starting and running.

b. Draw speed torque characteristics of a 3-phase IM. A 4-pole, 3-phase induction motor is energized from a 50 Hz supply, and is running at a load condition for which the slip is 0.03. Determine: (a) Rotor speed, in rpm (b) Rotor current frequency, in Hz (c) Speed of the rotor's rotating magnetic field with respect to the stator frame, in rpm.