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END TERM EXAMINATION

FIRST SEMESTER [B.TECH.] MARCH 2023

Paper Code: ES-107

Subject: Electrical Science

Time: 3 Hours

Maximum Marks: 75

Note: Attempt five questions including Q.No.1 which is compulsory.
Select one question from each unit.

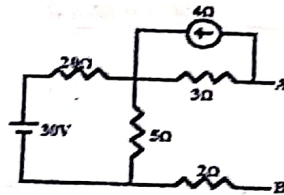
Q1 Attempt all:

(3x5=15)

- Explain the terms complex power, apparent power, real power and reactive power.
- Show that power consumed in a pure capacitive circuit is zero when a sinusoidal AC voltage is applied.
- A coil has a resistance of $25\ \Omega$ at 15°C . If the temperature coefficient of resistance at 15°C is $0.004/\text{K}$, determine the resistance of the coil at 80°C .
- Explain different methods used for damping in measuring instrument.
- Explain the essential difference between cylindrical (smooth) and silent pole rotors used in large alternators.

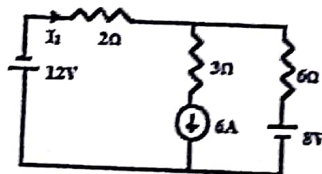
UNIT-I

Q2 a) Find the thevenin's circuit across AB as shown in figure 1. (7)



b) State and prove maximum power transfer theorem for dc networks. (8)

Q3 a) Determine the current I_1 as shown in the figure (2) by the superposition theorem. (7)



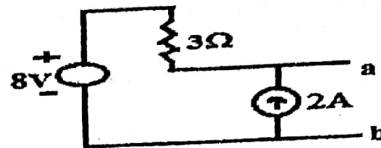
b) Obtain the Thevenin equivalent across a-b for the network shown in figure (3). (8)

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UNIT-II

- Q4 a) A coil has an impedance of 0.05 H and a resistance of 10Ω . It is connected to a sinusoidal 200V , 50 Hz supply. Calculate the impedance, current, power consumed and power factor. (8)
- b) Calculate the average and RMS value of a full rectified sine wave. (7)
- Q5 a) Show that the resonant frequency of a series RLC circuit is the geometric mean of the lower and upper cut-off frequency. (8)
- b) A single phase load of 30kW at 0.6 power factor lagging is fed from 200V a.c. supply. Calculate the kVA and kVAR of the load. (7)

UNIT-III

- Q6 a) Draw and explain the circuit diagram of different type of DC generator. (8)
- b) Why is rotating field system is used in preference to a stationary field? A 6-pole alternator rotates at 1000 r.p.m. What is the frequency of the generated voltage? (7)
- Q7 a) Discuss different methods of speed control of a DC motor. (8)
- b) Derive the expression showing the relationship between speed, frequency and number of poles of a synchronous machine. A waterwheel alternator has 20 poles. Calculate the speed for a frequency of 50 Hz . (7)

UNIT-IV

- Q8 a) Describe the operation of single phase transformer, explain clearly the function of the different parts. Why the cores are laminated? (8)
- b) Explain the following in case of measuring instruments. (7)
- i) Deflecting torque
 - ii) Controlling torque
 - iii) Damping torque
- Q9 a) Describe short circuit and open circuit test in a transformer. (7)
- b) Describe with diagrams the construction and principle of operation of the permanent magnet moving-coil instrument, drive and expression for the torque. (8)

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