

END TERM EXAMINATION

FIRST SEMESTER [B. TECH.] MARCH 2023

Paper Code: ES-107

Subject: Electrical Science

Time: 3 Hours

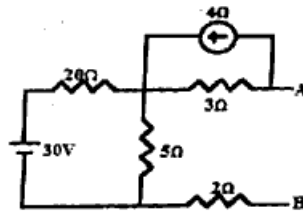
Maximum Marks: 75

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.

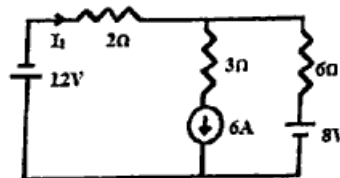
UNIT-I

- 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)

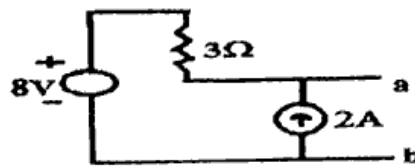
- Q3 a) Determine the current I_1 as shown in the figure (2) by the superposition theorem. (7)



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

P.T.O.

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UNIT-II

- Q4 a) A coil has an impedance of $0.05\ \Omega$ and a resistance of $10\ \Omega$. 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. <https://www.ggsipuonline.com> (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)
