Question Paper

Exam Date & Time: 26-Nov-2018 (08:30 AM - 11:30 AM)



FIRST SEMESTER B.TECH END SEMESTER EXAMINATIONS, NOV 2018 Basic Electrical Technology [ELE 1051 - 2018 -CHM] Duration: 180 mins.

Marks: 50

Α

Answer all the questions. Instructions to Candidates: Answer ALL questions Missing data may be suitably assumed

1)

A) Using source transformation technique, reduce the circuit ⁽³⁾ shown into a circuit consisting of a single voltage source in series with a resistance.



^{B)} Determine the resistance between terminals A and B in the ⁽³⁾ circuit shown using network reduction technique.



^{C)} Determine the current through the 2.5Ω resistor in the ⁽⁴⁾ circuit shown using node voltage analysis.



²⁾ In the circuit shown, determine the maximum power that ⁽⁴⁾ (4) can be delivered to the variable resistor R_L .



- ^{B)} Two coils with terminals AB and CD respectively are (2) placed side by side. The first coil has an inductance of 1000 mH and the second one of 800 mH. When B is connected to C, the equivalent inductance between A and D is 2000 mH. Determine the mutual inductance between the two coils. What would be the equivalent inductance between A and C when B is connected to D.
- C) A cylindrical piece of iron of length 50 cm and diameter 5 ⁽⁴⁾ cm is bent to form a perfect ring with no gap. It is uniformly wound with a coil of 100 turns. A voltage of 25 V is induced when the current through the coil increases uniformly from 0 to 5 A in 2 milliseconds. Find the relative permeability of iron. In due course of time an air gap of 1 mm is developed at the joint, find the new reluctance of the ring. What is the current required to produce a flux of 0.1 mWb in the ring?
- ³⁾ A series RLC circuit with R = 20 ohms, L = 50mH and C = ⁽⁴⁾ ⁽⁴⁾ 100 μ F is connected across a 200V, 50Hz, single phase AC supply. Determine (i) the current drawn (ii) power factor (iii) real, reactive and apparent powers (iv) value of additional inductance required to make the power factor

unity.

^{B)} A domestic electrical installation has the following loads connected to 230V, 50Hz single phase AC supply:

Accessory	Power	Power factor	Number used
Compact Fluorescent lamp	15 W	0.9 lag	3
Fan	60 W	0.75 lag	2
Refrigerator	200 W	0.86 lag	1
Mixer Grinder	1000 W	0.6 lag	1

What should be the rating of the capacitor to be connected across the load for unity power factor operation?

- ^{C)} An RLC series circuit of $R = 8 \Omega$ resistance should be ⁽³⁾ designed to have a bandwidth of 50Hz. Determine the value of L and C so that the system resonates at 200Hz. Also, determine the half power frequencies.
- ⁴⁾ A symmetrical 400V, 50Hz, 3 phase supply is connected to ⁽⁴⁾ an unbalanced delta connected load. The load impedances are 100 Ω between R and Y, 318 mH between Y and B and 31.8 µF between B and R. Find the line currents if the phase sequence is RYB. Take V_{RY} as the reference.
 - A balanced, 3phase, star connected load is fed from a 400 ⁽³⁾
 V, 3 phase, 50Hz supply. The current per phase is 25 A lagging and active power absorbed by the load is 13.856
 KW. Determine the (i) resistance and inductance of the load per phase (ii) total reactive and apparent powers.
 - C) Two wattmeter method is used to measure the total power ⁽³⁾ consumed in a 3 phase, balanced, star connected, lagging power factor load. One of the wattmeter shows a reading of 1860 watts and the pointer of the second wattmeter goes below zero. When the potential coil of the second wattmeter is reversed, it shows a reading of 320 watts. Find (i) total power consumed (ii) power factor of the circuit (iii) impedance per phase if the supply voltage is 400V.
- ⁵⁾ With a neat connection diagram, explain the working of a ⁽³⁾ transformer having load connected to its secondary.
 - ^{B)} With relevant diagrams, explain the construction of 3 ⁽⁴⁾ phase Induction motor.

(3)

^{C)} With a neat diagram, explain the working of a conventional ⁽³⁾ energy meter.

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