Reg. No.										

MANIPAL ACADEMY OF HIGHER EDUCATION

FIRST SEMESTER B.TECH. EXAMINATIONS – FEBRUARY-MARCH 2022

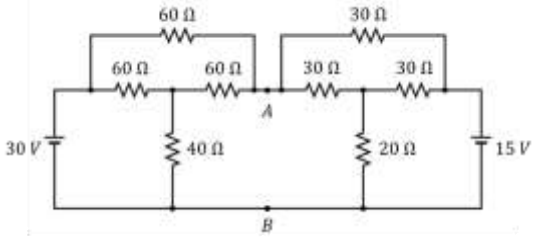
SUBJECT : ELE 1051/ELE_1051: BASIC ELECTRICAL TECHNOLOGY (DTQ)

Monday, February 28, 2022

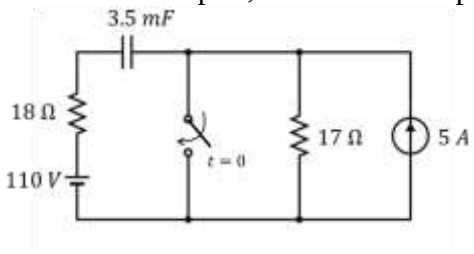
Time: 03:20 – 05:00 Hrs. Maximum Marks: 40

PART – B

1A. Find Thevenin's equivalent of the network across terminals A and B. If any value whatsoever may be selected for load resistance across terminals A and B, what is the maximum power that could be dissipated in it?



1B. In the circuit shown, initially, the switch was open for an extended period. It is then closed at t = 0. Obtain and plot the expression for capacitor voltage for t > 0. Also, find the time, and indicate it in the plot, at which the capacitor voltage is 60 V.



(5+5 = 10 marks)

2A. The magnetic circuit shown in below Fig. 2A is made of a material having relative permeability of 1500. The limb AB is wound with a coil of 800 turns. Find the current through the coil to produce a flux of 4 mWb in the air-gap AE. The length of each air gap is 4mm and the square cross-sectional area of the frame is 4 cm^2.

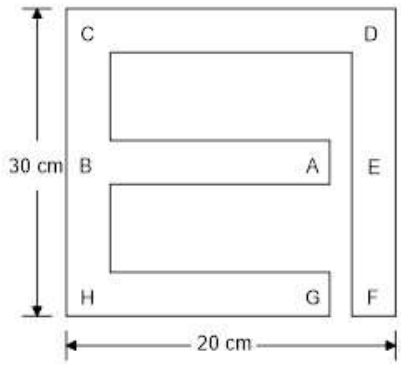
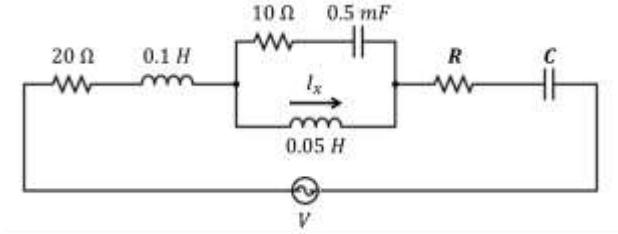


Fig. 2A.

2B. A constant supply voltage of 230 V is applied to a coil connected in series with a capacitor. The resistance of the 0.5 H coil is 10 Ω, and the capacitance of the capacitor is 40 μF. Find (a) the supply frequency at which the circuit current will be in phase with the supply voltage, (b) the maximum circuit current, (c) voltage across the coil, and (d) Q-factor of the circuit.

(6+4 = 10 marks)

3A. The circuit shown below has a source of 230 V, 50 Hz. If the current through 0.05 H inductor is $3.5 \angle -80^0\ A$, find the value of 'R' and 'C'. Also, find the power factor of the circuit and draw the respective power triangle. Assume supply voltage to be the reference phasor.



3B. Three identical coils, each of resistance 10 Ω and inductance 42 mH, are connected (a) in star and (b) in the delta to a 415 V, 50 Hz, 3-phase supply. Determine the total power consumed in each case. Is the power consumed in the two cases the same or different? What is the reason for this?

(5+5 = 10 marks)

4A. A 3-phase, 400 V, 50 Hz AC supply with phase sequence ABC is connected to an unbalanced delta connected load with impedances
$\mathrm{Z_{AB}} = 6 + \mathrm{j}10\ \Omega;\ \mathrm{Z_{BC}} = 7 - \mathrm{j}12\ \Omega$ and $\mathrm{Z_{CA}} = 50\ \Omega$. Find,

a) Line currents, $\overline{I_A}, \overline{I_B}, \& \overline{I_C}$

b) Total active power consumed by the load

4B. With a neat diagram, explain the working principle of transformer. Also mention the types of transformers and their applications.

4C. With a neat diagram, explain the role of commutators in a DC motor. Where are they used?

(4+3+3 = 10 marks)