MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

I SEMESTER B.TECH MAKEUP EXAMINATIONS, DEC 2016 - JAN 2017

SUBJECT: BASIC ELECTRICAL TECHNOLOGY [ELE 1001]

REVISED CREDIT SYSTEM

Time: 3 Hours   **Date: 05 January 2017 (9 am-12 Noon)**   **Max. Marks: 50**

Instructions to Candidates:
- ❖ Answer **ALL** the questions.
- ❖ Missing data may be suitably assumed.

1A. Determine the current through the 10 Ω resistor shown in Fig. 1A.
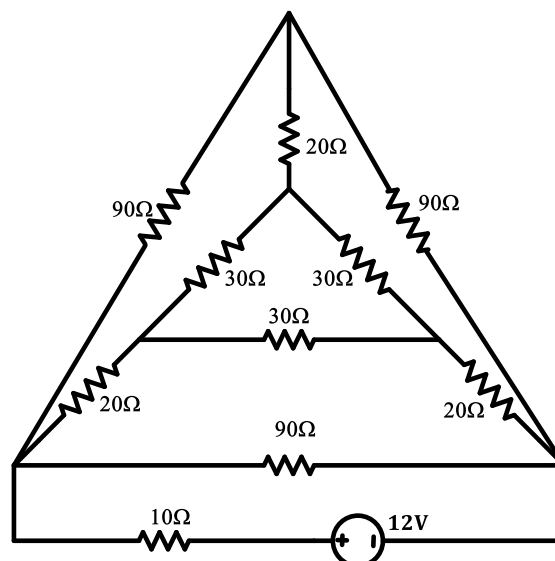

Fig. 1A   **(05)**

1B. Apply Mesh Current Method to circuit shown in Fig. 1B and determine the current I_0.
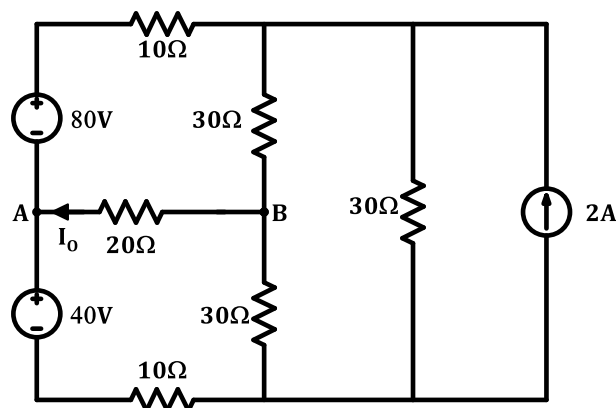

Fig. 1B

(05)

2A. For the network shown in Fig. 2A, (i) find the expression for current in the capacitor branch, $i_C(t)$ and voltage across the capacitor, $v_C(t)$ following the closure of the switch at $t=0$ on to position **A**. (ii) If the switch is closed to position **B** at $t = 60ms$, determine the new expression for $v_C(t)$ and $i_C(t)$.
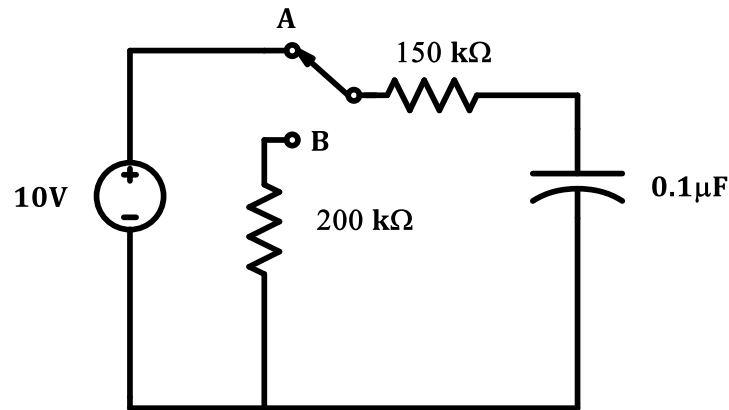
A

150 kΩ

B

10V

200 kΩ

0.1μF

Fig. 2A

(04)

2B. The magnetic circuit made of mild steel shown in Fig. 2B has a uniform cross sectional area of 500mm². Given L_{AD}=150mm, L_{ABCD}=L_{AFED}=340mm, and Air gap length=1mm. Calculate the MMF required to set up a flux of 2mWb in the central limb. Neglect leakage and fringing. Relative permeability of mild steel is 500.
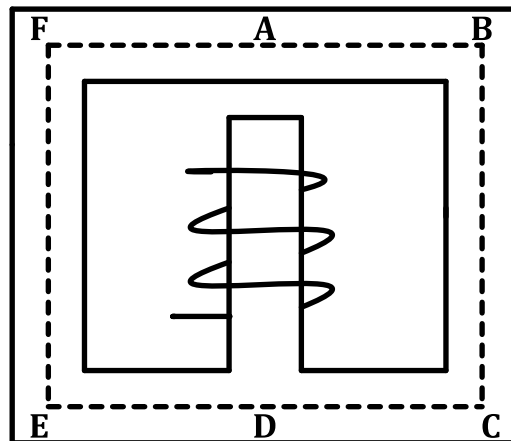
F ————— A ————— B

E ————— D ————— C

Fig. 2B

(06)

3A. Obtain the dot equivalent circuit for the coupled circuit shown in Fig. 3A. Give the expression for the emf induced in the whole circuit and determine the equivalent inductance. k_{12}=0.3, k_{13} =0.6, k_{23} =0.9.
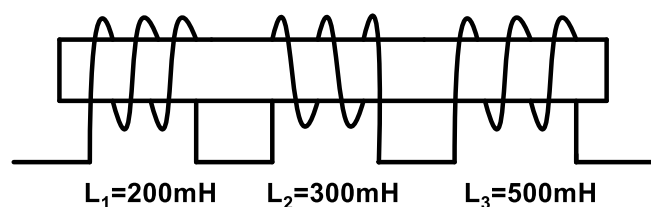
L_1=200mH L_2=300mH L_3=500mH

Fig. 3A

(05)

3B. A choke coil of resistance 8Ω and inductance of 0.15H is connected in series with a capacitance of 125μF across a single phase AC supply as shown in Fig. 3B. Calculate the (i) Impedance of the circuit (ii) Current drawn (iii) Active Power consumed.
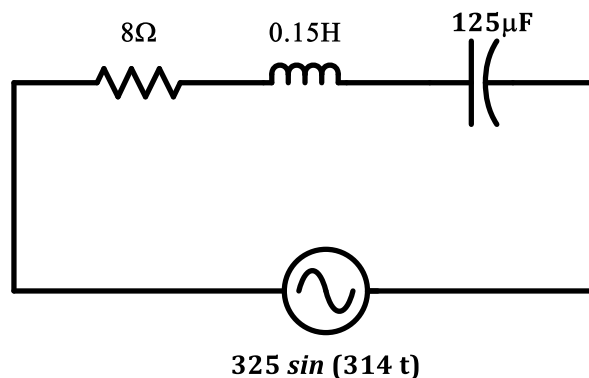

8Ω $0.15H$ $125\mu F$

$325 \sin (314 t)$

Fig. 3B *(05)*

4A. The load connected to a 230 V, 50 Hz AC supply consists of:
  1) heating load of 2 kW (upf)
  2) a load of 1.2 kW at 0.6 power factor lagging
  3) a load of 1.5 kW at 0.8 power factor lagging
Calculate (i) the total active, reactive and apparent power associated with the loads and the overall power factor (ii) the value of capacitance to bring the power factor to 0.9 lag. *(05)*

4B. A 3-phase 400 V, 50 Hz symmetrical supply is connected to unbalanced delta connected load. The load impedances are Z_{RY} = (4 + j3) Ω, Z_{YB} = (6 + j8) Ω, Z_{BR} = (5 + j12) Ω. Find the line currents. Let phase sequence be RYB and V_{RY} be the reference. *(05)*

5A. A 3 phase, 415 V, 50 Hz, RYB system supplies to three equal impedances of values (12 + j5) Ω each connected in star. Determine the line currents. Draw the circuit diagram for two wattmeter method for measurement of power and find out the readings of two wattmeters. *(06)*

5B. Write a technical note on the role of the transformer in an electric transmission and distribution network. *(04)*