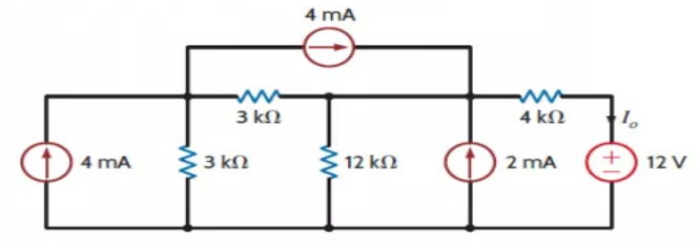
Manipal Institute of Technology Bengaluru
Department of Electrical and Electronics Engineering
Assignment – 1st (I Semester, 2022-23)
Subject - Basic Electrical Technology (ELE1071)

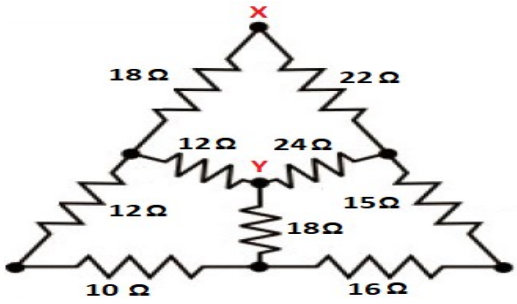
Due Date: 12-11-23 Max. Marks – 10

Name:	**Reg No.:**

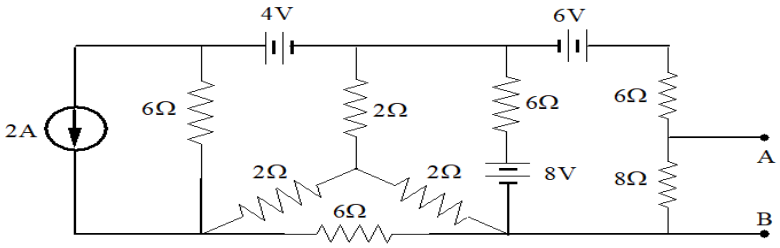
Q1. (a) For the following circuit, find i_0 in using source transformation



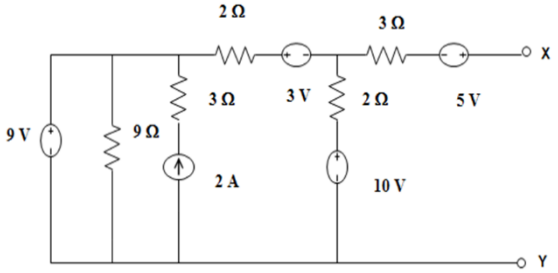
(b). The equivalent resistance between terminals X and Y of the circuit in Figure is ?



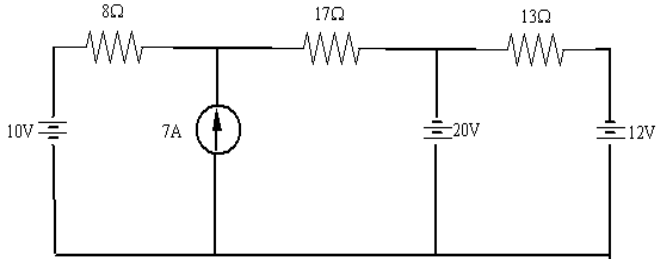
Q2. (a) Determine the value of load resistance to be connected across AB such that maximum power is transferred to the load.



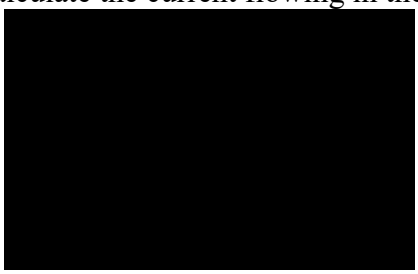
(b) Obtain Thevenin's equivalent circuit across x-y terminals.



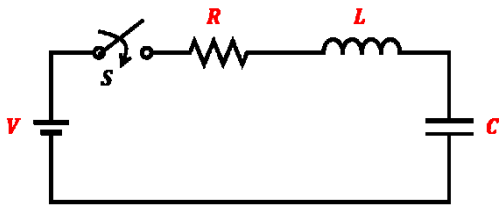
Q3. (a). Calculate the power dissipated in 17Ω resistor using superposition theorem.



(b). Using the super position calculate the current flowing in the 10Ω resistance in the circuit shown



Q4. (a) For the circuit in below Figure, assuming switch was open for a sufficiently long time and then closed at t = 0, the $\frac{di}{dt}$ at t = 0^+ is _____ A/s.

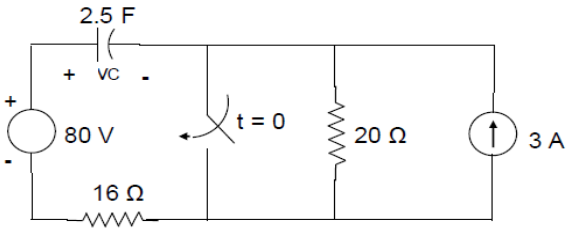


(b). For the in Figure 5, the switch was in open position for a long time, and then operated as shown.

A. The capacitor voltage at t = 0 is ?

B. The capacitor voltage at t = ∞ is ?

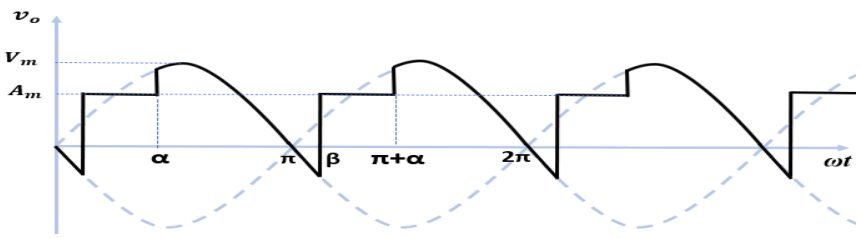
C. The capacitor voltage becomes x V at time ?



Q5. (a) Determine the following.

A. Determine the average value of the waveform if α=75°, β=200° , $V_m = x$, $A_m = y$

B. Determine the rms value of the waveform if α=75°, β=200° , $V_m = x$, $A_m = y$

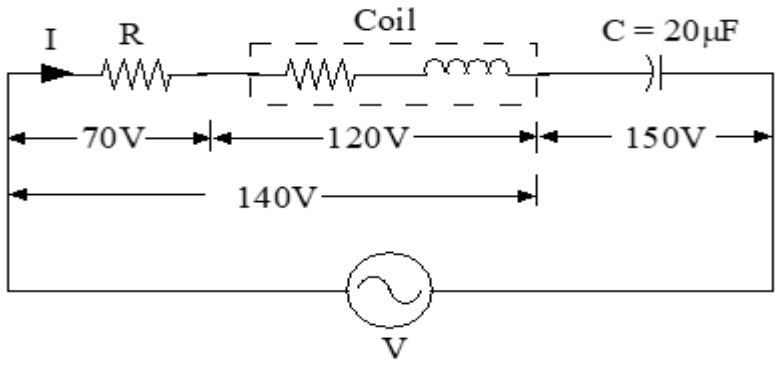


(b). Three circuits A, B and C are connected in parallel across a single-phase AC supply.

A. Circuit A consists of a bank of lamps taking a current of 10 A at unity power factor.
B. Circuit B consists of a coil taking a current of 20 A at a power factor of 0.8.
C. Circuit C consists of a resistor and capacitor in series, taking a current of 10 A at a power factor of 0.9.
D. The power consumed in circuit A is 2000 W
   a) The magnitude of the supply current will be?
   b) The magnitude of the supply voltage is ?
   c) The total power dissipated by the circuit is ?
   d) The power factor of the whole circuit is ?

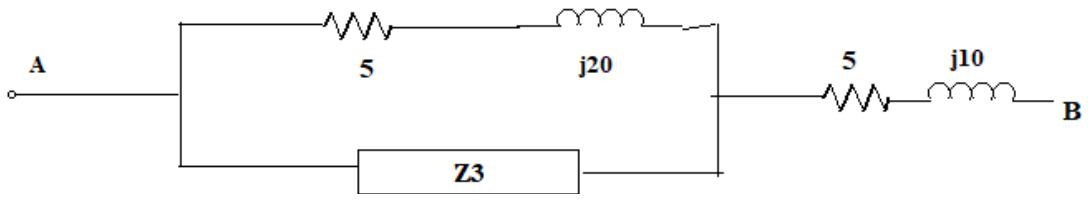
Q6. (a). Two inductive loads 0.5 kW at 0.6 pf lag, 1 kW at 0.8 pf lag are respectively connected in parallel across 230 V, 50 Hz, supply. Find the total current taken by the combination. Draw the power triangle. Find the value of capacitance connected in parallel to improve power factor to 0.9 lag.

(b). The current flowing through the circuit is 2.355A. If the voltages are as indicated, find the applied voltage and frequency.



Q7 . (a). A circuit consists of resistance of 10Ω, and an inductance of 16 mH, and a capacitance of 150 uF connected in series. A supply of 100 V at 50 Hz is given to the circuit. Find the current, power factor, and power consumed by the circuit.

(b). When 220 V AC supply is applied across AB terminals in the circuit shown in the figure. The total power input is 3.25 kW and the current is 20 A. Find the current through Z3.



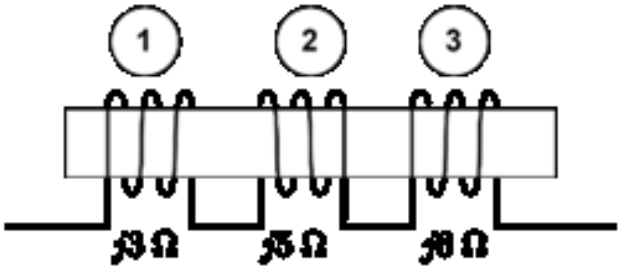
(c). A current of 5 A flows through a non-inductive resistance in series with a choking coil when supplied at 250 V 50 Hz. If the voltage across the resistance is 125 V and across the coil 200 V, calculate

1. Impedance, reactance and resistance of the coil
2. The power absorbed by the coil
3. The total power
4. Draw the vector diagram

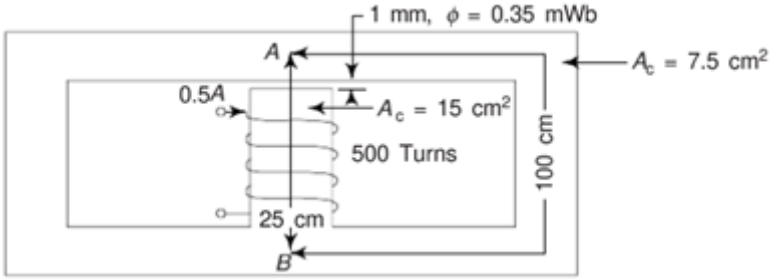
Q8.(a) Three similar coils, each having a resistance of 8 Ω and an inductive reactance of 8 Ω are connected in star across a 415 V, 3-phase, 50 Hz supply. Calculate active, reactive, and apparent power of the load and individual wattmeter readings if the power is measured by two-wattmeter method.

(b). The 3-phase star connected balanced load has an impedance of Z = (8 + j6) Ω per phase. If the load is connected to 3-phase, 208 V supply and two-wattmeter method is used to measure the power, find the readings of the wattmeters and load power factor using wattmeter readings. Also find the total active, reactive, and apparent power.

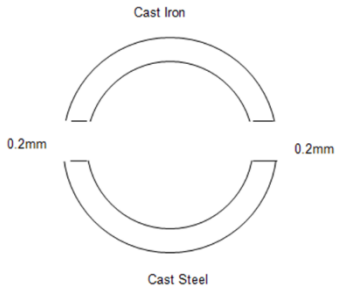
Q9. (a) The following circuit is supplied from a 50 Hz source with current entering from RHS. Draw the dotted equivalent circuit and determine the equivalent inductance if the coefficient of coupling between coils 1 & 2 and coils 2 & 3 is 0.7 each and that between coils 1 & 3 is 0.4.



(b). The magnetic circuit shown in the below fig has a coil of 500 turns wound on the central limb which has an air gap of 1 mm. The magnetic path from A to B via each outer limb is 100 cm and via the central limb is 25 cm (air gap length excluded). The cross-sectional area of the central limb is 5 cm* 3cm and each outer limb is 2.5 cm *3 cm. A current of 0.5 A in the coil produces an air gap flux of 0.35 mWb. Find the relative permeability of the medium.



Q10. (a). A ring has a diameter of 21 cm and a cross-sectional area of 10 cm^2. The ring is made up of semicircular sections of cast iron and cast steel, with each joint having a reluctance equal to an air-gap of 0.2 mm. Find the ampere-turns required to produce a flux of 8 $x10^{-4}$ Wb. The relative permeability of cast steel and cast iron are 800 and 166 respectively. Neglect fringing and leakage effects.



(b). A core, having square cross-section, is shown in Figure 6. It is made of two ferromagnetic materials, A and B with a relative permeability of 600 and 1200 respectively.

A. A coil of Y turns is wound on the core. The current required in the coil to produce a flux of X Wb is ?
B. If an air gap of 2 mm is made in part A by a saw-cut, the total reluctance of the circuit is ?
C. With respect to question 1B above, the current required to produce X Wb flux with Y turns is ?