QUESTION 1

(a) State two Kirchoff's Law. Define **ONE (1)** of them by sketching an appropriate diagram to support the answer. (5 marks)

(b) Based on the Figure 9, calculate the current flow through the 4Ω resistor using **mesh analysis**. (10 marks)

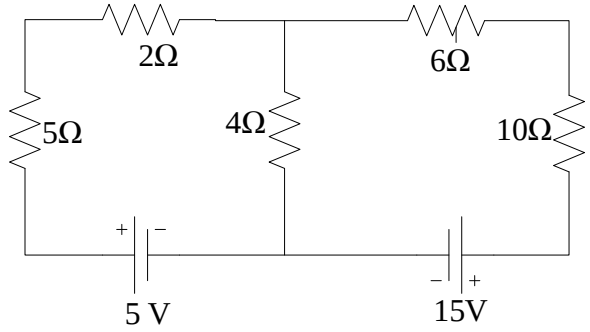


Figure 9

(c) For the Figure 10 below, calculate I_{RL} using Thevenin's Theorem. (10 marks)

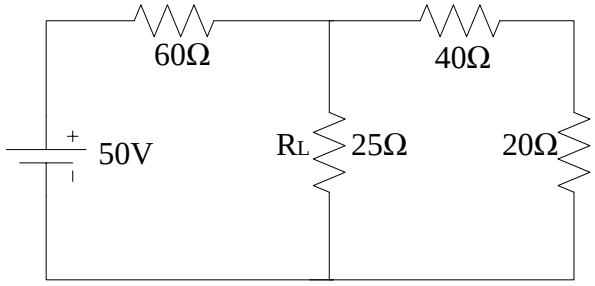


Figure 10

QUESTION 2

a. Based on Figure C (2a), calculate the current flow through 15Ω resister using Kirchhoff's Law.

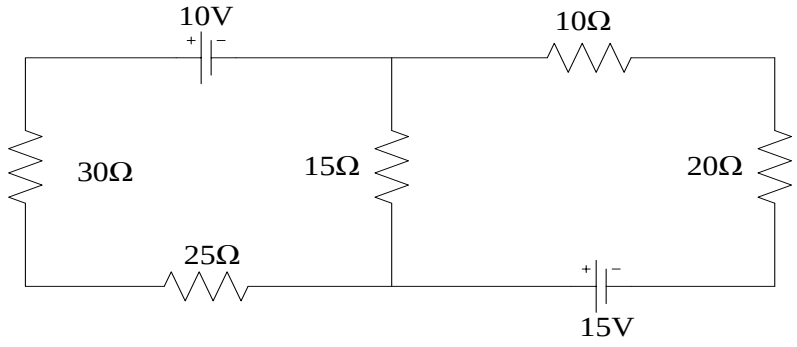


Figure C (2a)

(15marks)

b. Based on Figure C (2b), calculate :

i. Total resistance
ii. Total current
iii. Current flow through 10Ω resistor
iv. Voltage drop at 15Ω resistor

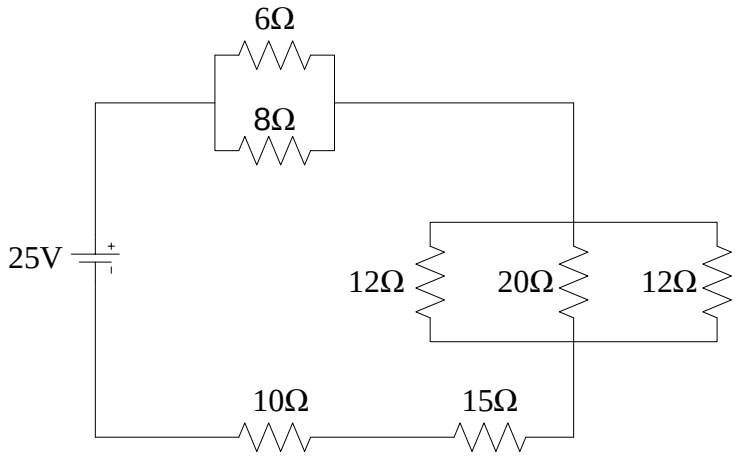


Figure C (2b)

(10marks)

QUESTION 3

(a) Sketch the graph Voltage in volt versus Current in ampere. What is the quantity that will be represented by the slope of the graph? (3 marks)

(b) For the Figure 11 below, calculate :

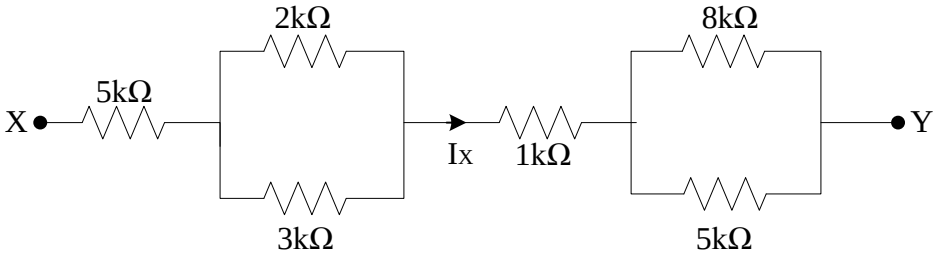


Figure 11

i. Equivalent resistance at terminal XY (3 marks)
ii. Voltage across 2kΩ resistor if the voltage terminal XY is 150V. (3 marks)
iii. Current through 5kΩ resistor if Ix = 20mA. (3 marks)

(c) Based on the Figure 12, using Delta-Star Transformation, calculate the current flow and voltage drops at 15Ω resistor. (13 marks)

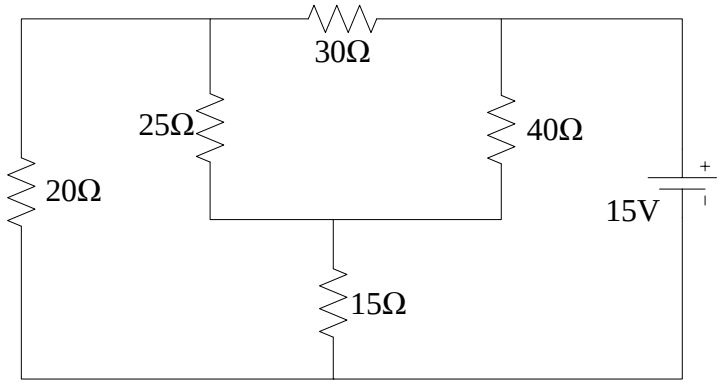
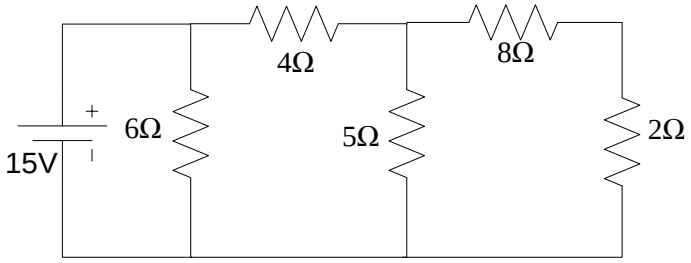


Figure 12

QUESTION 4

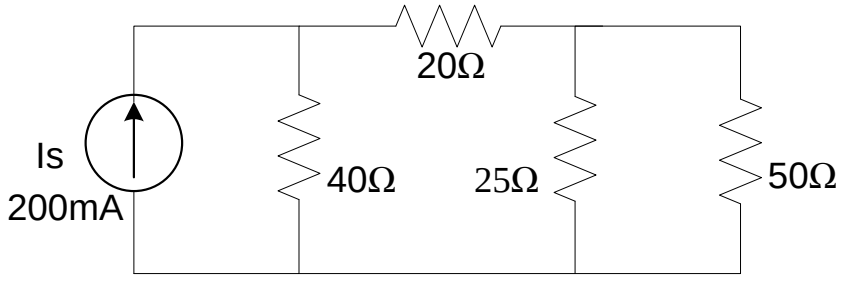
a. Using the Thevenin Theorem find the RL=5Ω in Figure C(1a)



(15 marks)

Figure C(1a)

b. Using the Norton Theorem find the current flow through RL= 25Ω.



(10 marks)

QUESTION 5

(a) Briefly explain Faraday's Law. (3 marks)

(b) The current 3A is flowing in a solenoid with 200 turns and 25mm length. Given that the solenoid diameter is 10mm, μ_r is 650 and μ_0 is 1.256 x 10^{-6}. Find the value of inductance that exists in the solenoid. (5 marks)

(c) A circuit has a 25Ω resistor that is connected in series with a 1.5H inductor. The circuit is connected to 200V power supply. Determine the:

i. Time constant (2 marks)
ii. Current in time (i) (4 marks)
iii. Current at 0.02s (2 marks)
iv. Initial rate of rising current (2 marks)
v. Energy stored in inductor (2 marks)

(d) Based on the Figure 13, find the total inductance and energy stored in the circuit. (5 marks)

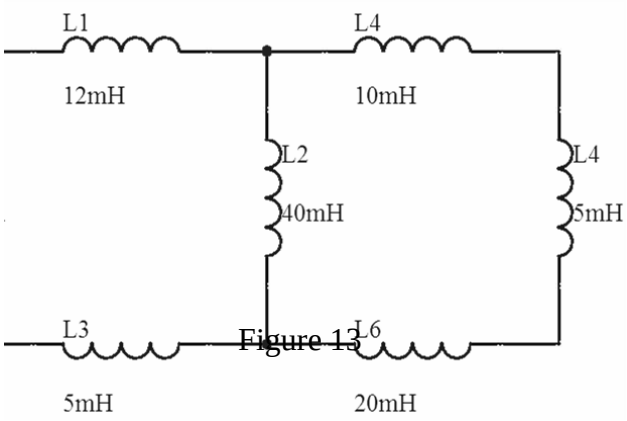


Figure 13

QUESTION 6

a. Based on Figure C (2a), calculate the total inductance at terminal A B.

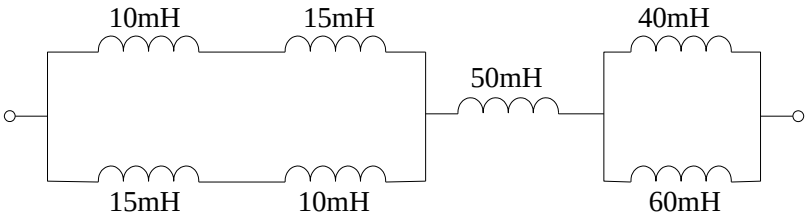


Figure C (2a)

(4 marks)

b. If the total capacitance of the two 25μF capacitor connected in series and the value of one capacitor is 40μF. Draw the circuit and calculate the value of other capacitor.

(5 marks)

c. A resistance of 15kΩ connected in series with inductance of 25H across dc supply of 150V power supply. Find :

i. Time constant
ii. Maximum current
iii. Time taken for current to rise at 0.02A.
iv. Energy stored
v. Sketch a labeled graph to show the rising current. (12 marks)

d. A coil 250 turns is wounded to an iron core with cross sectional area 5cm^2 and 20cm length. If relative permeability is 750 and current 5A flow through it, calculate the coil inductance.

(4 marks)

QUESTION 7

a. Based on the Figure C (1b), calculate the total inductance.

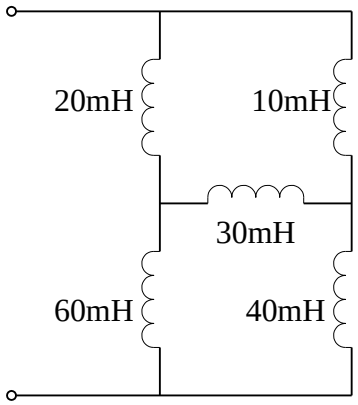


Figure C (1b)

(6 marks)

b. A capacitor plate has 1mm length and 0.2mm width and separate by 0.05mm dielectric. If relative permittivity of dielectric is 450. Calculate the capacitance. ($\varepsilon_0 = 8.854 \times 10^{-12}$)

(5 marks)

c. An 150μ F capacitor connected in series with 1.5kΩ resistor connected across a 220V DC supply. Calculate :

i. Initial value of current
ii. Time constant
iii. Equation of current in time function
iv. Value of current at time equal to (ii)
v. Rate at which current begins to decrease. (14 marks)