

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(MID SEMESTER EXAMINATION)

CLASS: BTECH/IMSC  
BRANCH: BT/CHEMICAL/CIVIL/MECH/PIE/PHYSICS

SEMESTER: I  
SESSION: MO/2022

SUBJECT: EE101 BASIC OF ELECTRICAL ENGINEERING

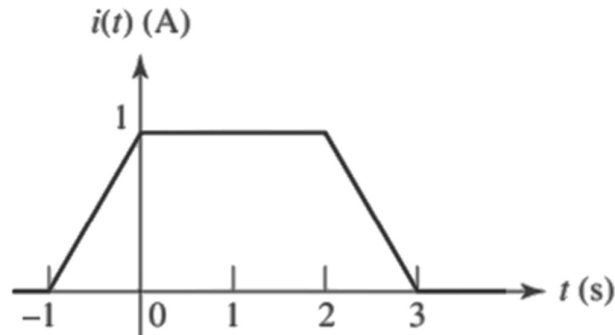
TIME: 2 HOURS

FULL MARKS: 25

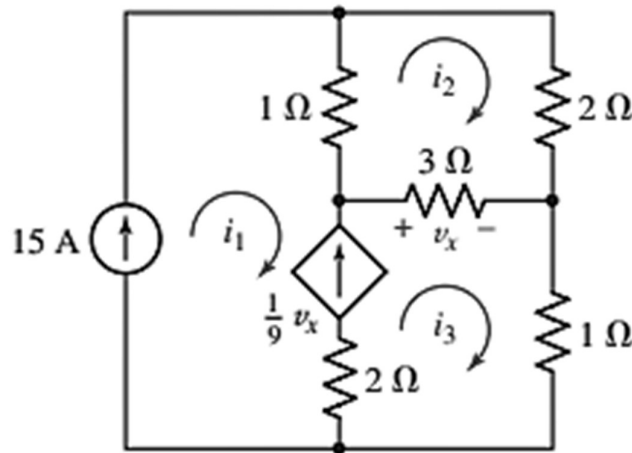
**INSTRUCTIONS:**

1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates

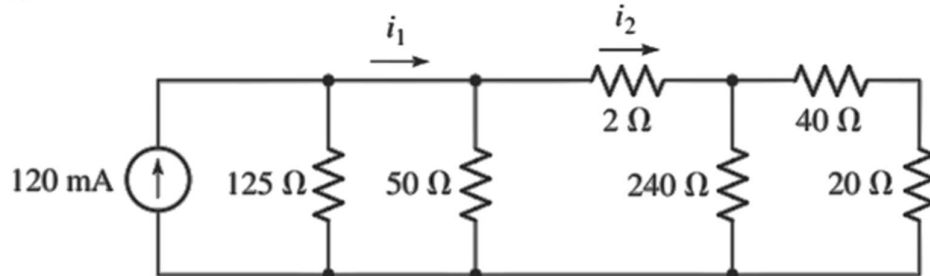
Q.1(a) Determine and sketch the voltage in a 3 H inductor if the current waveform is as [2] CO BL  
CO1 BL3  
below:



Q.1(b) Evaluate the mesh currents. [3] CO1 BL3



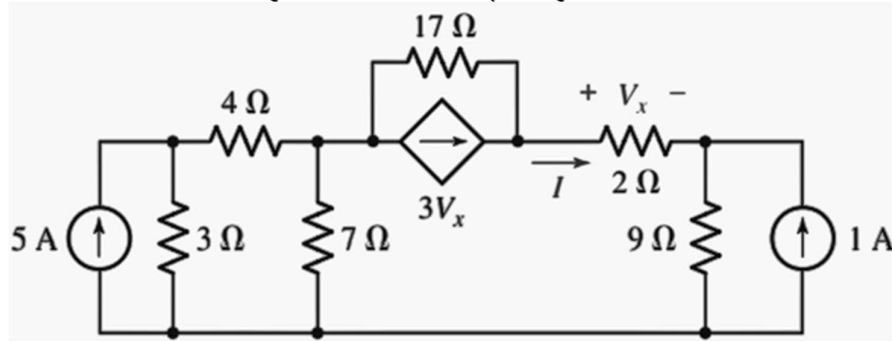
Q.2(a) Apply current division and resistance combination methods to find  $i_1$  and  $i_2$ . [2] CO1 BL3



PTO

Q.2(b) Examine the current through the  $2\Omega$  resistor by using source transformations.

[3] CO1 BL4



Q.3(a) What is a magnetic circuit?

[2] CO1 BL2

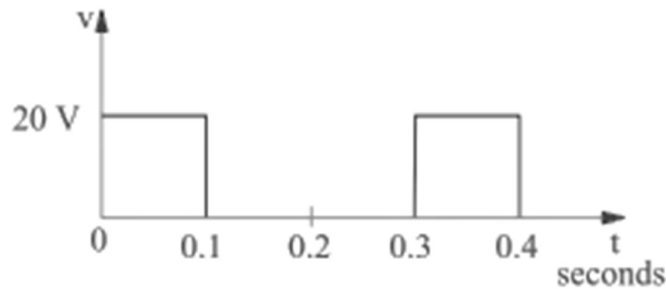
Give the analogy between a magnetic circuit and an electrical circuit.

Q.3(b) A ring of ferromagnetic material has a rectangular cross-section. The inner diameter is 7.4 in., the outer diameter is 9 in., and the thickness is 0.8 in. There is a coil of 600 turns wound on the ring. When the coil carries a current of 2.5A, the flux produced in the ring is  $1.2 \times 10^{-3} \text{ Wb}$ . Express (i) Magnetic field intensity (ii) Reluctance and (iii) Permeability

[3] CO1 BL2

Q.4(a) Compute the average and effective values of the square voltage wave shown.

[2] CO2 BL2



Q.4(b) The instantaneous values of two alternating voltages are represented respectively by  $v_1 = 60 \sin \theta$  volts and  $v_2 = 40 \sin (\theta - \pi/3)$  volts. Derive an expression for the instantaneous value of the sum of voltages using the phasor diagram.

[3] CO2 BL3

Q.5(a) Sketch the variation of reactance and current with frequency for a purely inductive and capacitive circuit.

[2] CO2 BL3

Q.5(b) A coil having a resistance of  $12 \Omega$  and an inductance of  $0.1 \text{ H}$  is connected across a  $100 \text{ V}$ ,  $50 \text{ Hz}$  supply. Calculate (a) the reactance and the impedance of the coil; (b) the current; (c) the phase difference between the current and the applied voltage.

[3] CO2 BL3