

Question Paper

Exam Date & Time: 27-Apr-2023 (09:30 AM - 12:30 PM)



MANIPAL ACADEMY OF HIGHER EDUCATION

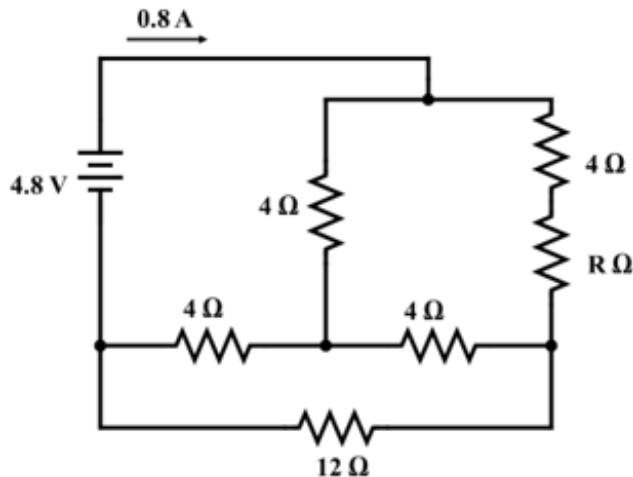
FIRST SEMESTER B.TECH. (MAKEUP) EXAMINATIONS - APRIL 2023
SUBJECT: ELE-1071 / ELE -1051 - BASIC ELECTRICAL TECHNOLOGY
(REGULARS - LATE ADMISSION BATCH)

Marks: 50

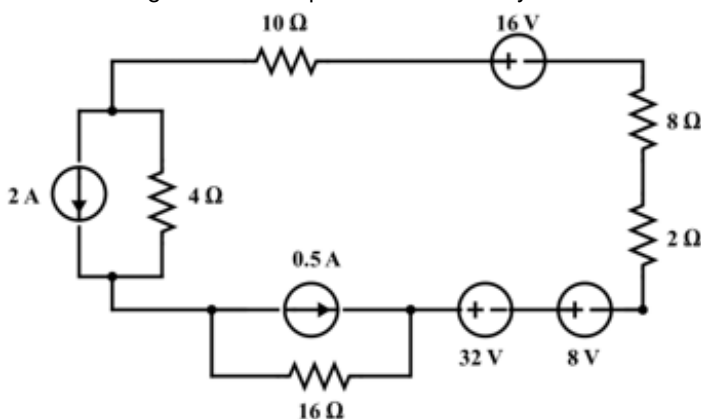
Duration: 180 mins.

Answer all the questions.

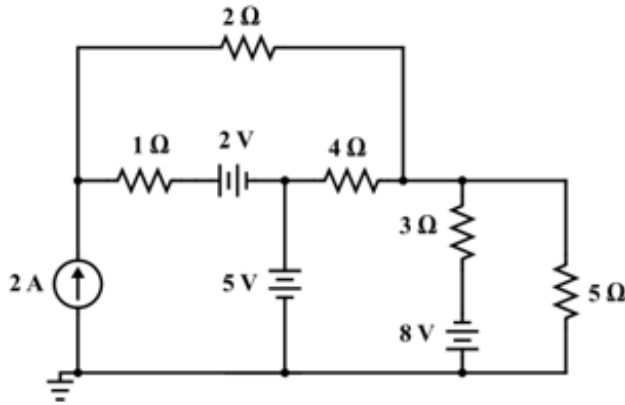
- 1A) Determine the value of resistor '**R**' in the circuit shown with a supply current of **0.8 A**. (3)



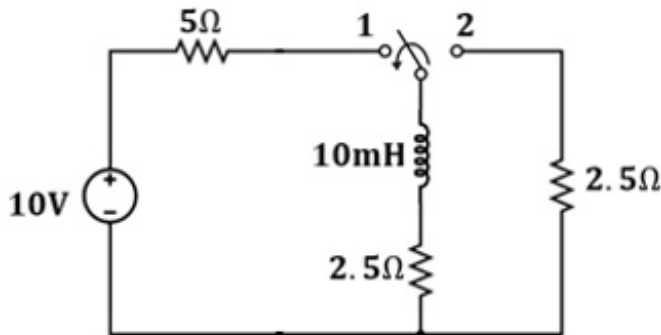
- 1B) Find the voltage across and power consumed by the **2 Ω** resistor in the circuit. (3)



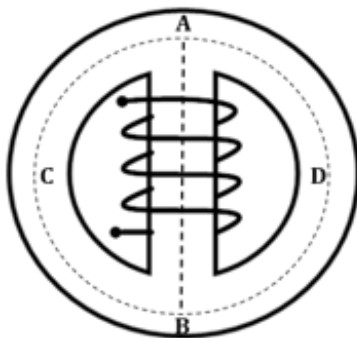
- 1C) In the network shown, find the power supplied by the **2 A** source using node voltage analysis. (4)



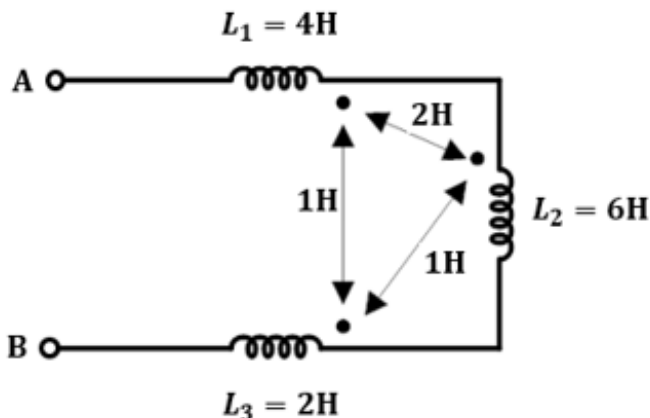
- 2A) For the network shown, the switch is closed on to position 1 at $t = 0$ and then moved to position 2 at $t = 1.4 \text{ ms}$. Determine the current in the inductor when $t = 2.5 \text{ ms}$. (3)



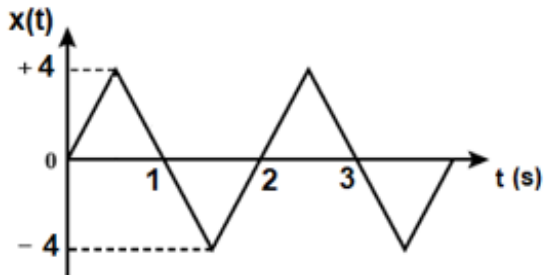
- 2B) For the magnetic circuit shown, the reluctance of the central limb (AB) is $10 \times 10^5 \text{ AT/Wb}$ and the reluctance of the outer limbs (ACB and ADB) are same and equal to $15 \times 10^5 \text{ AT/Wb}$. The number of turns in the coil is 1000. Central limb AB has flux density of 1.25 Tesla and a mean length of 10 cm. Assuming uniform area of cross section, determine (4)
- the current to be flowing in the coil to produce 0.5 mWb in limb ADB.
 - The relative permeability of the magnetic material.



- 2C) Determine the equivalent inductance seen at terminals A & B in the given network. Also compute the coupling coefficients k_{12} , k_{23} and k_{13} . (3)

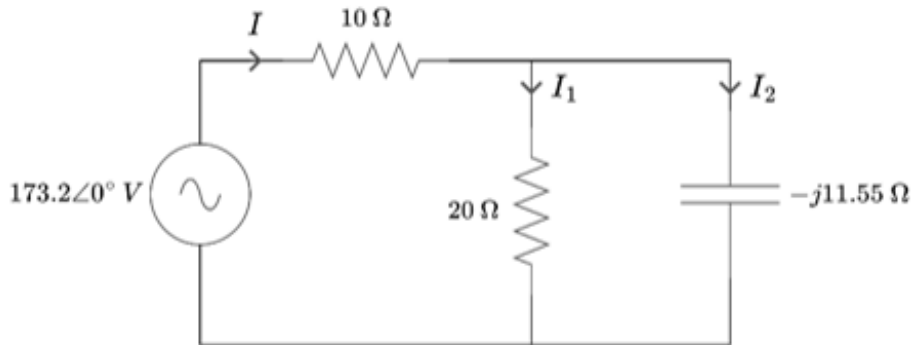


- 3A) Determine the RMS value of the following signal. (3)



- 3B) An $8\ \Omega$ resistor is connected in series with a coil of resistance R_L and inductance L and the whole combination is supplied with a **120 V, 50 Hz, 1-phase** AC source. If the voltage across $8\ \Omega$ resistor is **32 V** and **104 V** across the coil, determine the impedance of the coil. (3)

- 3C) For the circuit shown, evaluate the current through and voltage across each element. (4)



- 4A) A coil of resistance $50\ \Omega$ and inductance $0.318\ \text{H}$ is connected in parallel with a circuit comprising a $75\ \Omega$ resistor in series with a $159\ \mu\text{F}$ capacitor. The resulting circuit is connected to a **230 V, 50 Hz**, AC supply. Calculate: (a) the supply current (b) the circuit impedance, resistance, and reactance. (4)

- 4B) A **3-phase, 400 V, Y-connected, ABC** system supplies an unbalanced **Y-connected** load of impedances $Z_A = 25\ \angle 0^\circ$, $Z_B = 11\ \angle -20^\circ$ and $Z_C = 15\ \angle 10^\circ$. Assuming V_{AB} as reference voltage, determine line currents, total power consumed and current in the neutral of the system. (6)

- 5A) Three similar choke coils are connected in star to a three-phase supply. If the line current is 15 A, the total power consumed is 11 kW and the volt-ampere input is 15 kVA, find the line and phase voltages, the VAR input and the reactance and resistance of each coil. (4)

- 5B) Sketch a one-line diagram of a power system network architecture indicating voltage levels at various stages. (3)

- 5C) How are transformers classified? Elaborate. (3)

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