MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

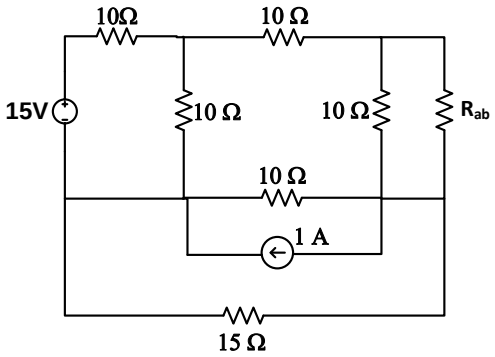
FIRST SEMESTER B. TECH. DEGREE - IN-SEMESTER EXAMINATION

BASIC ELECTRICAL TECHNOLOGY [ELE 1051]

Time: 10:30 AM TO 12 NOON **20 JANUARY 2022** **Max. Marks: 20**

Note:
- Assume missing data, if any.
- Use only non-programmable calculators.

1A. Determine R_{ab} such that the power absorbed by it will be maximum. Also, find the delivered power.



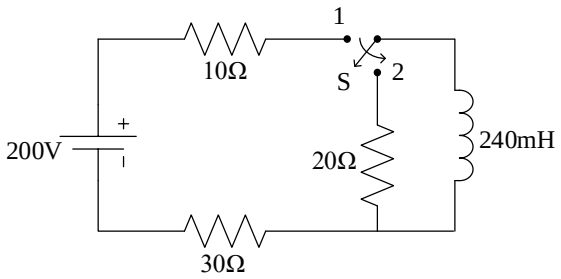
[3M]

1B. In the given network, initially the switch S was at position 1 and then shifted to position 2 at $t = 15\ ms$.

a) Determine the inductor current $i(t)$ and voltage across inductor $v_L(t)$ at $t = 12\ ms$ and $t = 20\ ms$

b) Determine time taken by inductor current to reach the value $2.5\ A$.

c) Sketch the inductor current $i(t)$ for $0 \leq t \leq 25\ ms$.

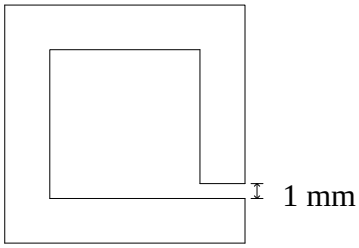


[4M]

1C. Magnetic circuit having single air gap as shown below has total mean length of 0.6 m and the square cross-sectional area of $16\ cm^2$. The left limb of the core is wound with 500 turns, and it carries 1.5 A of current. Relative permeability of the core is 1200.

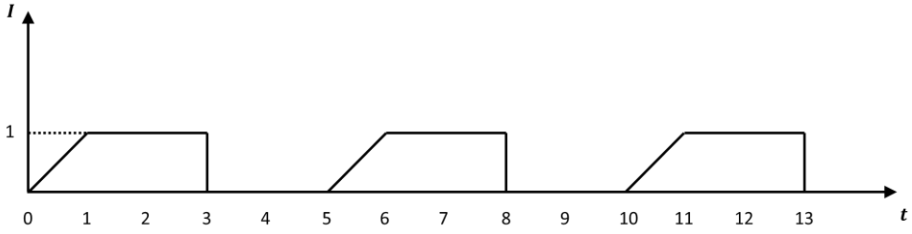
a) Find the flux density in the air gap.

b) To restrict the maximum flux density to 0.5 T, how much additional air gap needs to be inserted in the core.



[3M]

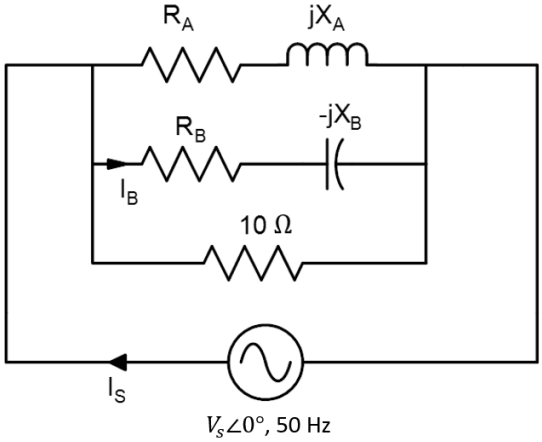
2A. Find the average and RMS value of the given current signal. Also find the average power if the current signal is fed to a resistor of 1Ω.



[3M]

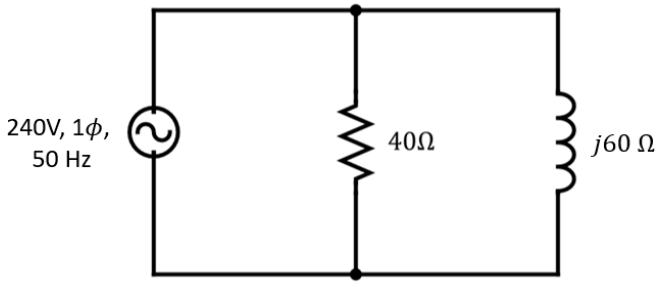
2B. In the circuit shown, supply current I_S is $20\angle -15° \, A$, current I_B is $10\angle 45° \, A$ and the power consumed by 10 Ω resistor is 1000 W. Find,

a) Supply voltage V_S
b) Resistances R_A and R_B
c) Reactances X_A and X_B



[4M]

2C. For the given circuit, calculate the value of capacitor to be connected in parallel so that the net reactive power in the system becomes zero. Draw the associated phasors.



[3M]