

FACULTY OF ENGINEERING

B.E. 2/4 (ECE) I-Semester (Main) Examination,
November/December, 2009

Subject : BASIC CIRCUITS ANALYSIS

Time : 3 Hours]

[Max. Marks : 75

Note : Answer all questions of Part-A. Answer five questions from Part-B.

PART - A

(25 Marks)

1. The equivalent circuit of a battery is shown in figure (1). Obtain the relationship between the current I and terminal voltage V . Find the power supplied by the battery to the load, in terms of I .

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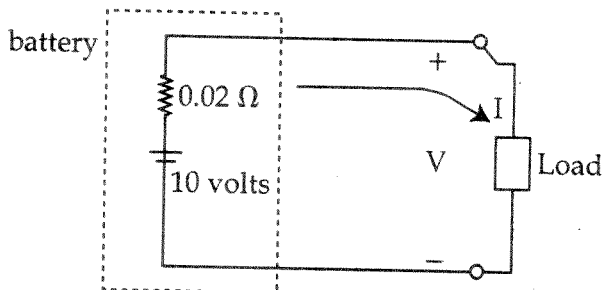


Figure 1

2. The current $i(t)$ shown in figure (2) is applied to a capacitor of 2 mF from $t = 0$ onwards. Initially there is no voltage across the plates of the capacitor. Find the voltage across capacitor at $t = 4 \text{ mS}$.

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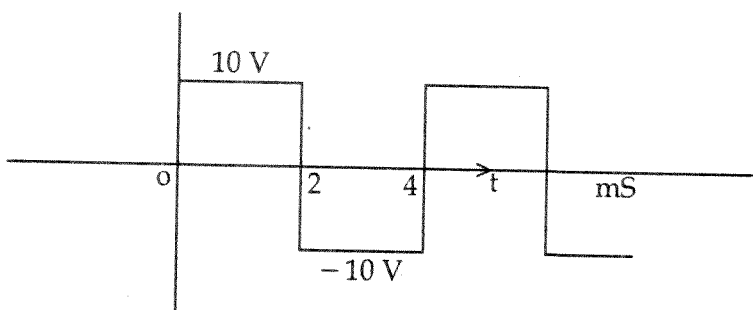


Figure 2

Contd...2

100180

3. Differentiate between zero-input response and zero-state response.

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4. Find $\frac{di}{dt}(0)$ and $\frac{d^2i}{dt^2}(0)$ in the circuit of figure (3) if $i_L(0^-) = 3$ A and $v_C(0^-) = 5$ V.

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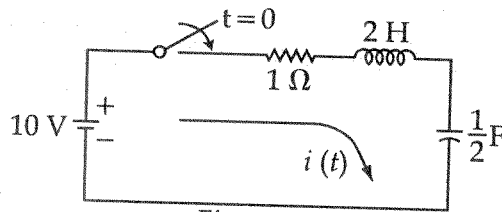


Figure 3

5. Define the terms : complex power, average power, reactive power, and apparent power.

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6. Find the Thevenin's equivalent voltage between A and B of the circuit of figure (4).

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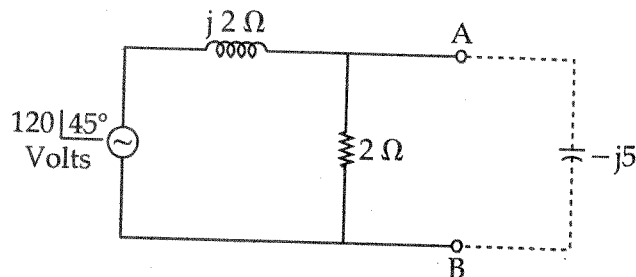


Figure 4

7. A $10 \mu\text{F}$ capacitor is in parallel with a practical inductor represented by $L = 1$ mH and $R = 10\Omega$. Find the resonant frequency of the parallel circuit.

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8. Draw the pole-zero plot of the impedance $Z(s)$ between terminals A and B of figure (5).

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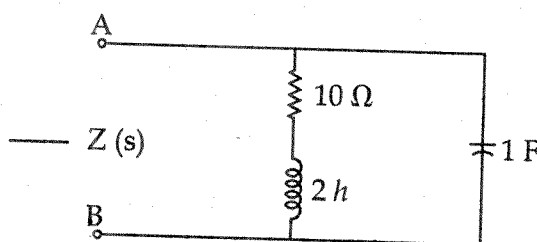


Figure 5

9. State Tellegen's theorem and explain its significance.

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10.

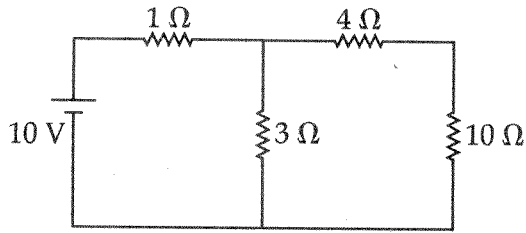


Figure 6

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In the figure (6), draw the graph of the circuit and show any two possible cut - sets.

PART - B**(50 Marks)**

11. Using superposition theorem, find in the circuit of figure (7). Also find the powers 10
supplied by the two voltage sources.

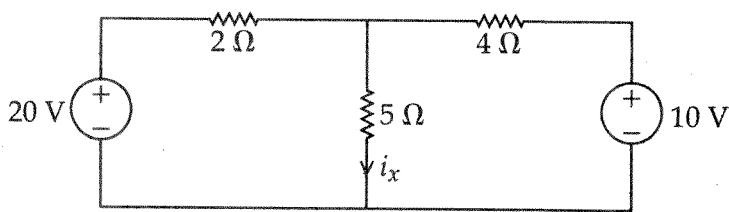


Figure 7

12. Find the current I in the circuit of figure (8) using nodal analysis. 10

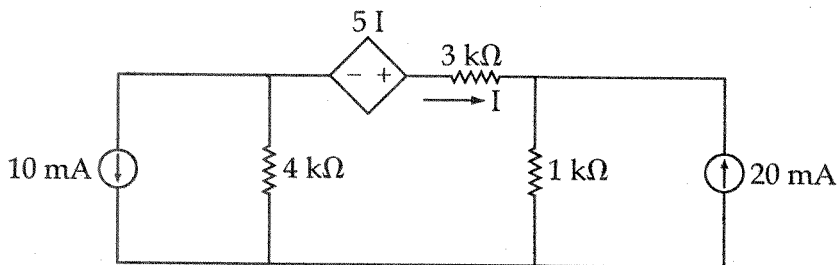


Figure 8

13. Find $i_L(t)$ for $t \geq 0$ in the circuit of figure (9). 10

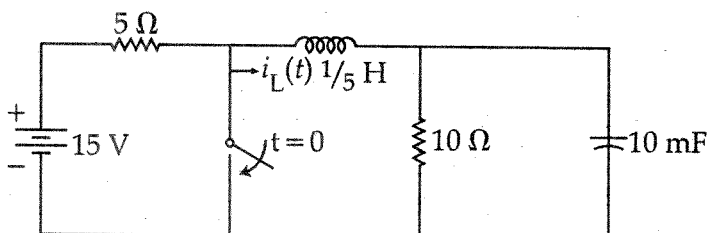


Figure 9

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14. (a) In the circuit of figure (10), find the value of R_L which draws maximum power. Calculate the value of the maximum power. 6

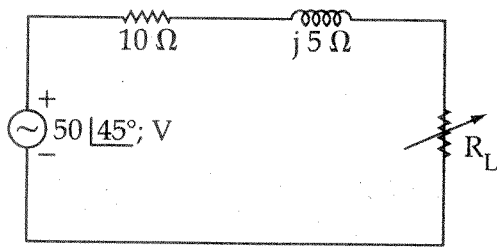


Figure 10

- (b) Define coupling co-efficient. Discuss dot convention for magnetically coupled circuits. 4
15. (a) Find the total average power dissipated in the circuit of figure (11). 7

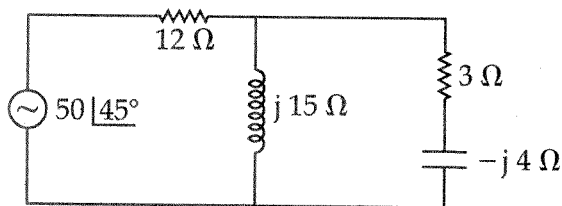


Figure 11

- (b) Define 'power factor' of an AC circuit. Discuss its significance. 3
16. (a) Find the band-width of a series RLC resonant circuit in terms of its quality factor and resonant frequency. 5

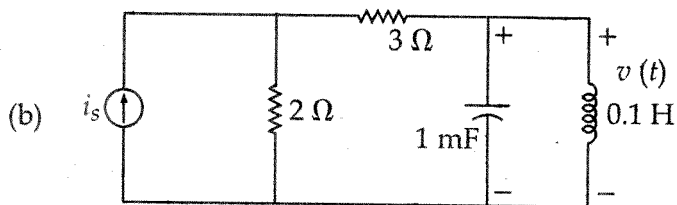


Figure 12

Find the natural response $v(t)$ if $v(0^-) = 10$ volts in the circuit of figure (12).

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17. (a) Define (i) Cut sets and fundamental cut sets.
(ii) Incidence matrix.
- (b) Draw the dual network for the network of figure (13).

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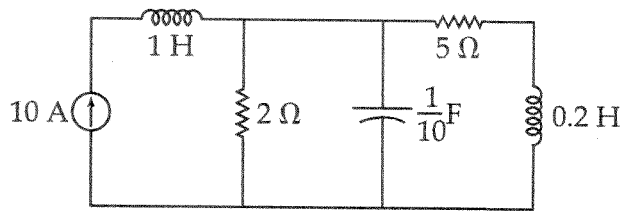


Figure 13

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