[Total No. of Questions - 9] [Total No. of Printed Pages - 4]
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B. Tech 3rd Semester Examination

Circuit Theory (N.S.)

EE-212

Time : 3 Hours **Max. Marks : 100**

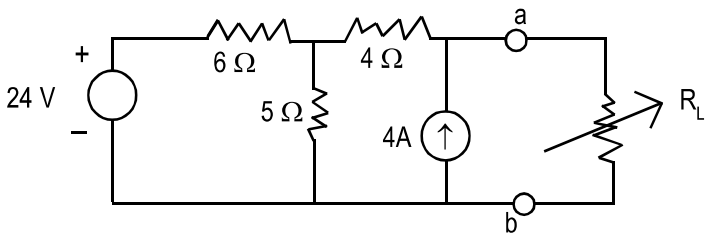
The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt five questions from all selecting one question from each section A, B, C & D and all the subparts of the questions in section E.

SECTION - A

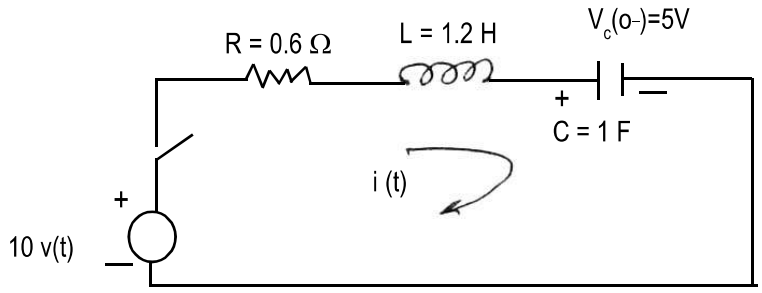
1. (a) State and explain the Thevenin's theorem. Consider both the cases of dependent and independent sources. **(10)**

   (b) Determine the Thevenin equivalent circuit of the circuit given below to the left of the terminal ab. Find the current through R_L if $R_L = 6\Omega$. **(10)**



2. (a) Determine the Laplace transform of the following function (i) Unit step function (ii) Unit ramp function, (iii) Unit impulse function. **(9)**

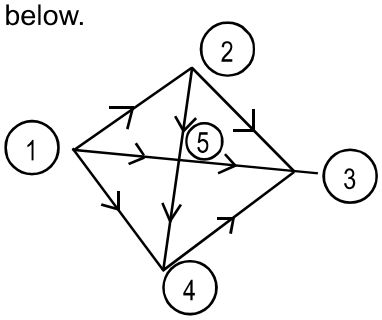
(b) In a series RLC network given below the initial voltage on the capacitor is 5V. Find i(t) following switching of the circuit. Assume zero initial condition for the inductor and polarity of charge as shown in the figure. **(11)**



SECTION - B

3. (a) What are the properties of a tree in a graph? Explain the procedure for obtaining fundamental tie set and cut set matrix with an example. **(12)**

(b) Obtain the tie set matrix and cut-set matrix for the graph shown below. **(8)**



4. (a) Define PR function. What are the properties of a P-R function? Explain the procedure of P-R function. **(12)**

(b) Test the function for its positive realness.

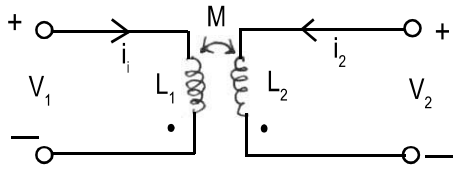
$$Z(s) = \frac{s^3 + 6s^2 + 5s + 4}{s^3 + 2s^2 + 3s + 3}$$ **(8)**

SECTION - C

5. (a) A 15 μF capacitor is connected through a 500 kΩ resistor to a dc source (10V). After being charged for half minute the capacitor is disconnected and discharged through a resistor (R). Determine the energy dissipated in R. **(10)**

   (b) Determine and derive an expression for the transient response of series R-C circuit with sinusoidal excitation. **(10)**

6. (a) Draw the time domain and frequency domain equivalent circuit of the following coupled circuit with the given dot convention. **(8)**

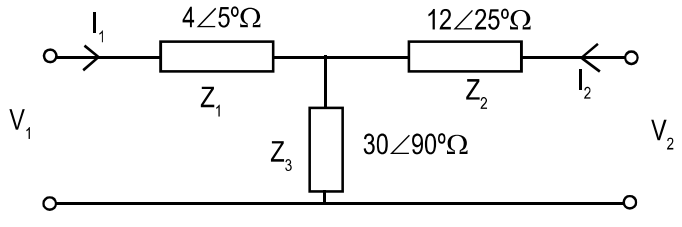


   (b) Two coupled coils have K=0.3. N_1=400 turns and N_2=600 turns. The mutual flux is being 0.6 Wb. Find the primary coil flux. If the primary current is 12A, find the primary coil inductance. Also determine the secondary inductance. **(12)**

SECTION - D

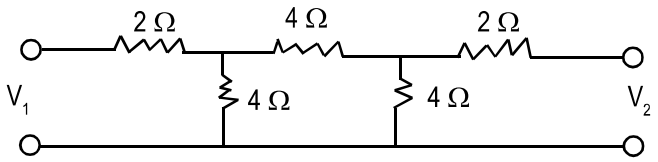
7. (a) Differentiate between one port, two port and n port network. **(10)**

   (b) Determine the Z-parameter for the following circuit. **(10)**



8. (a) What are the ABCD parameters for a two port network? Prove that for a symmetric two port network AD – BC=1. **(12)**

(b) Determine the ABCD parameters for the following network. **(8)**



SECTION - E

9. (a) State superposition theorem.

(b) Write the network equation for a series R-L circuit excited by step input in time domain and s-domain.

(c) Define final value theorem.

(d) Compare cut set and tie set matrix of a graph.

(e) What do you mean by graph, subgraph, path and connected graph?

(f) A function is given by $\frac{2s}{s+5}$. Draw pole zero plot.

(g) What are the conditions for which a polynomial P(s) is Hurwitz?

(h) Calculate the time taken by a capacitor of 5μF in series with 200 kΩ resistance to be charged up to 70% of the final value.

(i) Explain the condition of symmetry in Z parameter representation.

(j) Express Z parameters in terms of ABCD parameters. **(2×10=20)**