

Code No: 153AP

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech II Year I Semester Examinations, April/May - 2023

**ELECTRICAL CIRCUIT ANALYSIS**

(Electrical and Electronics Engineering)

Time: 3 Hours

Max. Marks: 75

- Note:** i) Question paper consists of Part A, Part B.  
 ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.  
 iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

**PART – A**

(25 Marks)

- 1.a) State Superposition Theorem. [2]
- b) What is the difference between loop and mesh? [3]
- c) Define the time constant of RC Circuit. [2]
- d) What is meant by natural and forced responses? [3]
- e) Define RMS Value. [2]
- f) What is the significance of operator 'j' in a.c. circuits? [3]
- g) Find the Laplace transform of  $\cos\omega t u(t)$ . [2]
- h) Write the characteristics of parallel resonance. [3]
- i) Write the y-parameters in terms of ABCD parameters. [2]
- j) What is the importance of interconnections of two port networks? [3]

**PART – B**

(50 Marks)

2. For the network shown in below Figure 1, find the node voltages  $V_1$  &  $V_2$ . [10]

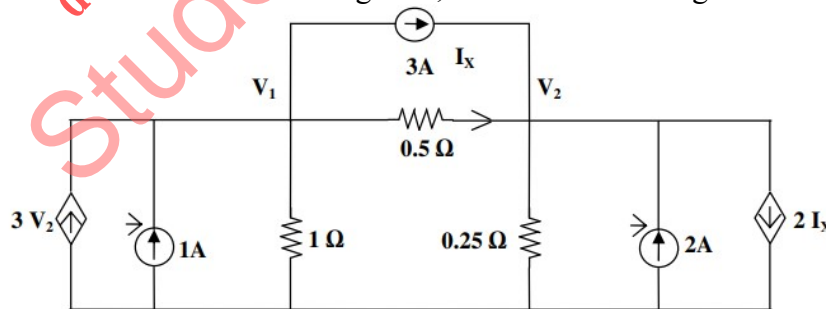


Figure 1

**OR**

- 3.a) Draw a dual network for the circuit shown below figure 2.

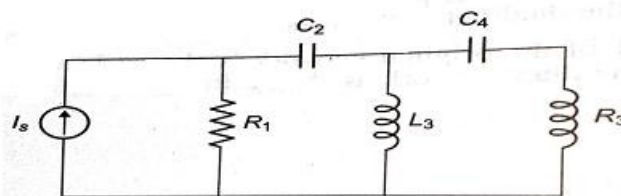


Figure 2

- b) Using Norton's theorem, find  $R_N$  and  $I_N$  of the circuit in figure 3 at terminals a-b. [5+5]

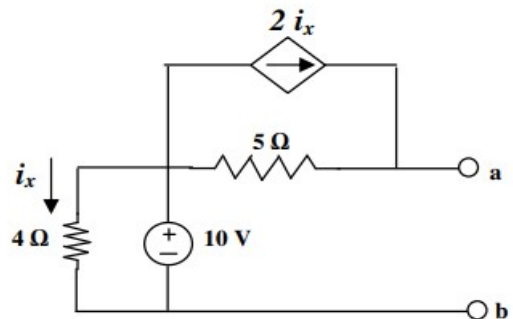


Figure 3

- 4.a) A RL series circuit is excited by sinusoidal voltage  $v(t) = V_m \sin(\omega t + \Phi)$ . Derive an expression for the current in the circuit.
- b) In an RL circuit shown in figure 4, the switch closes at  $t = 0$ . Determine the complete current response. [5+5]

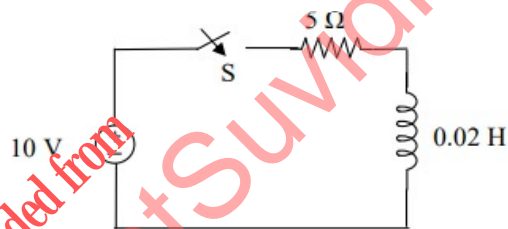


Figure 4

OR

5. In the RL circuit shown in figure 5, the switch is in position 1 long enough to establish steady state conditions and at  $t = 0$ . It is switched to position 2, find the resulting current. [10]

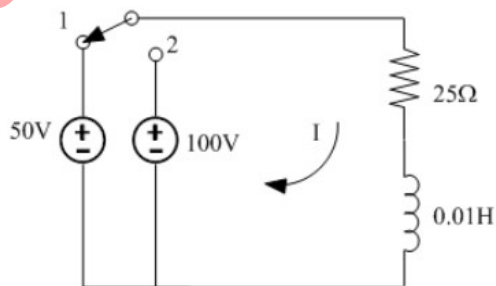


Figure 5

- 6.a) A capacitor of  $200 \mu\text{F}$  is connected across a 220V, 50Hz supply. Calculate (i) the reactance of the capacitor (ii) rms value of current (iii) the maximum current.
- b) Prove that the line voltage in a star connected RYB phase sequence three phase system leads the phase voltage by  $30^\circ$ . Obtain an expression for line voltage in terms of phase voltage. [5+5]

OR

7. Two coupled coils have self-inductances  $L_1 = 10\text{mH}$  and  $L_2 = 20\text{mH}$ . The coefficient of coupling (K) being 0.75 in the air, find voltage in the second coil and the flux of first coil provided the second coil has 500 turns and the circuit current is given by  $i_1 = 2\sin 314t$  A. [10]

- 8.a) Plot pole-zero diagram for system function  $H(s) = \frac{8(s+2)(s+3)}{s(s+4)(s^2+2s+2)}$ .

b) Write short notes on:

i) obtain the Laplace Transform of all standard input signals.

ii) Significance of network transfer function. [5+5]

**OR**

9. In the given circuit shown in figure 6, the switch is closed to position 1 at  $t=0$  and after a time equal to one time constant it is moved to position 2. Find the expression for current after moving to position 2. Assume zero initial charge on the capacitor. (Use Laplace transform technique). [10]

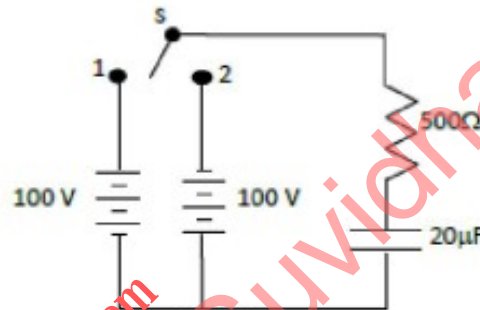


Figure 6

10. Find the Z and Y parameters of the given  $\pi$ - network shown in figure 7. All values of resistance are in ohms. [10]

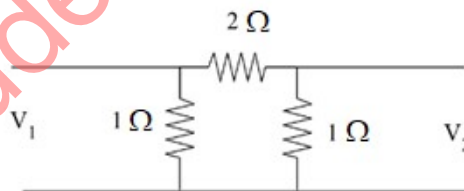


Figure 7

**OR**

- 11.a) The Z parameters of a two port network are  $Z_{11} = 10\ \Omega$ ,  $Z_{22} = 20\ \Omega$ ,  $Z_{12} = Z_{21} = 5\ \Omega$ . Determine i) The ABCD parameters of this network and ii) Its equivalent T network.

b) Determine the Z parameters of the following two port network (Shown in figure8).

[5+5]

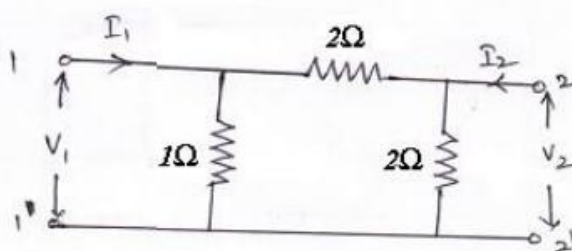


Figure 8

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