

K. J. Somaiya Institute of Technology, Sion, Mumbai-22  
(Autonomous College Affiliated to University of Mumbai)

~~Nov-Dec 2024~~ Jan/Feb 2025

Program: B. Tech Scheme III

Regular Examination: SY Semester: III

Course Code: EXC305 and Course Name: Electrical Network Theory

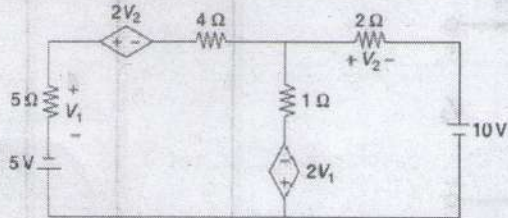
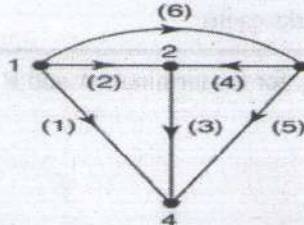
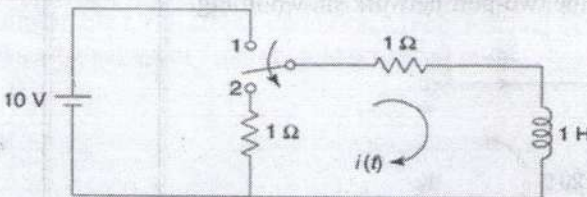
Date of Exam: 07-02-25

Duration: 02.5 Hours

Max. Marks: 60

Instructions:

- (1) All questions are compulsory.
- (2) Draw neat diagrams wherever applicable.
- (3) Assume suitable data, if necessary.

| Q. No. | Question                                                                                                                                                                                                                                                                                                       | Max. Marks | CO | BT level |
|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----|----------|
| Q 1    | Solve any <b>two</b> questions out of three: (05 marks each)                                                                                                                                                                                                                                                   |            |    |          |
| a)     | <p>Calculate mesh currents in the network shown in Fig.</p>                                                                                                                                                                  |            | 1  | Ap       |
| b)     | <p>Compute complete Incidence matrix and reduced Incidence matrix from the given graph</p>                                                                                                                                  | 10         | 2  | Ap       |
| c)     | <p>In the network of Fig. the switch is moved from the position 1 to 2 at <math>t = 0</math>, Steady-state condition having been established in the position 1. Determine <math>i(t)</math> for <math>t &gt; 0</math>.</p>  |            | 3  | Ap       |
| Q 2    | Solve any <b>two</b> questions out of three: (05 marks each)                                                                                                                                                                                                                                                   | 10         |    |          |
| a)     | Compute the voltage across the $5\Omega$ resistor in the network shown in Fig                                                                                                                                                                                                                                  |            | 1  | Ap       |

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|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

|     |                                                                                                        |    |    |
|-----|--------------------------------------------------------------------------------------------------------|----|----|
|     |                                                                                                        |    |    |
| b)  | Determine Z-parameters ( $Z_{11}$ and $Z_{12}$ ) for the network shown in Fig.                         | 4  | Ap |
| c)  | Enumerate whether the polynomial $P(s) = s^8 + 5s^6 + 2s^4 + 3s^2 + 1$ is Hurwitz by using Routh array | 5  | Ap |
| Q.3 | Solve any <b>two</b> questions out of three. (10 marks each)                                           | 20 |    |
| a)  | Compute Thevenin equivalent network of Fig. for the terminals A and B                                  | 1  | Ap |
| b)  | Calculate transmission parameters for the two-port network shown in Fig.                               | 4  | Ap |
| c)  | i) Draw the pole-zero diagram of $I_2/I_1$ for the network shown in Fig.                               | 5  | R  |

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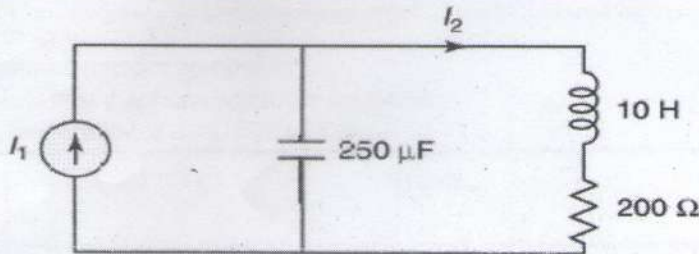
*Supplementary*

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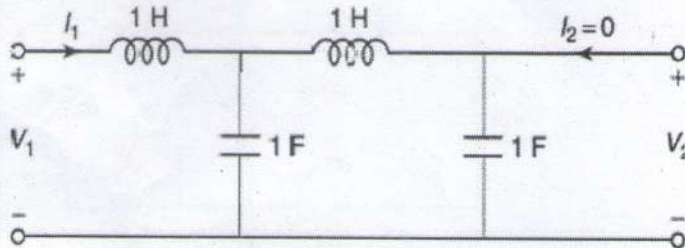
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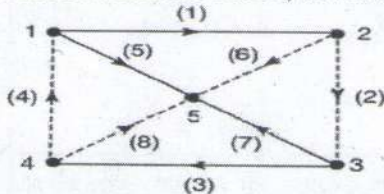
ii) Find the network functions  $V_1/I_1$  and  $V_2/V_1$ , for the network shown in Fig



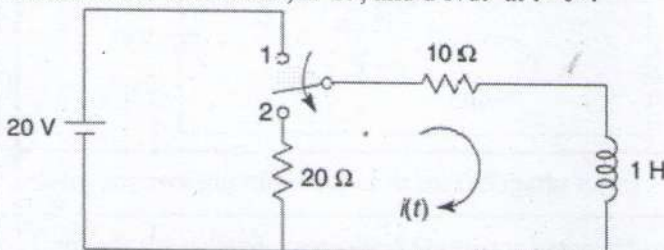
Q.4 Solve any **two** questions out of three. (10 marks each)

2

a) For the graph shown in Fig. Compute the complete incidence matrix reduced incidence matrix, tie set matrix and f-cutest matrix.



b) In the network shown in Fig. the switch is changed from the position 1 to the position 2 at  $t = 0$ , steady condition having reached before switching. Calculate the values of  $i$ ,  $di/dt$ , and  $d^2i/dt^2$  at  $t = 0+$ .



c) i) Test whether  $F(s) = (s+3)/(s+1)$  is a positive real function  
 ii) Test whether  $F(s) = (s^2+6s+5)/(s^2+9s+14)$  is a positive real function

2

Ap

3

Ap

6

Ap

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