

MAJIB

N.B. : (1) Question No. 1 is compulsory.

(2) Attempt any four questions out of remaining six questions.

(3) If necessary assume suitable data wherever required and justify the same.

(4) Figures to the right indicate marks.

B-E-W Introductory to Syst Design - 7/6/07

1. Attempt any four out of the followings :-

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- (a) Pertaining to the Simplex method explain the terms surplus, slack and artificial variables and their use.
- (b) Explain in brief methods to improve reliability.
- (c) Explain and compare primal and dual LPPs.
- (d) Write the dual for the following LPP.

Maximize $Z = 15x_1 + 2x_2 + 3x_3$

Subject to the constraints—

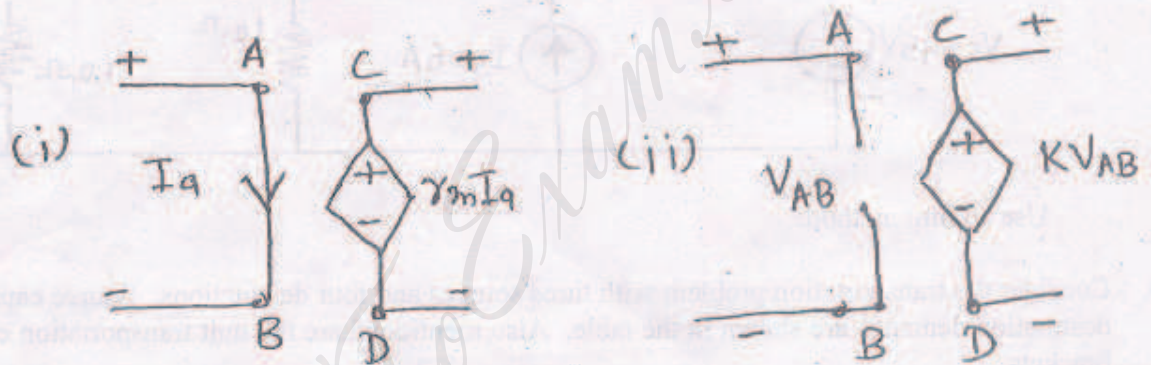
$$x_1 + x_2 + x_3 \leq 10$$

$$2x_1 - x_3 \leq 5$$

$$4x_1 - 2x_2 - 3x_3 \leq 8$$

and $x_1, x_2, x_3 \geq 0$

- (e) Draw adjoint networks for the following two port networks.



2. (a) State and prove Tellegen's Theorem.

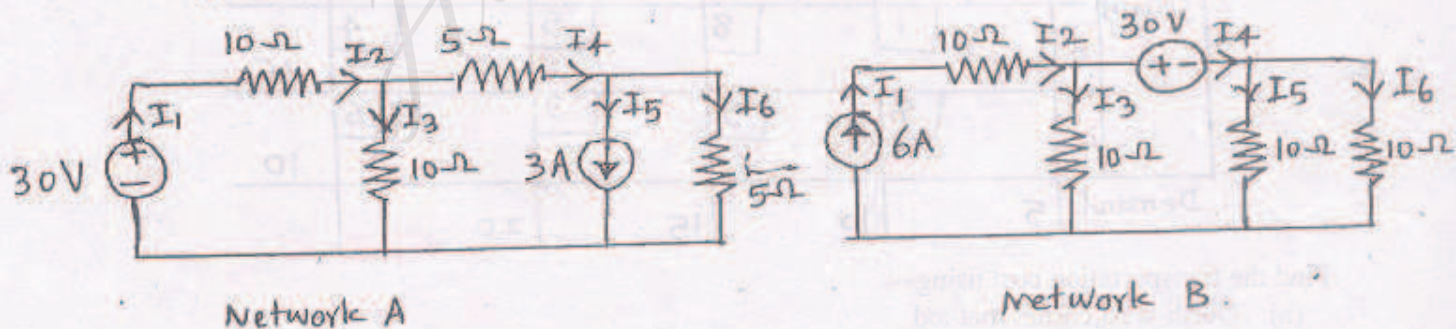
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(b) For the two topologically same networks shown below verify the relations—

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$$\sum V_{KA} I_{KB} = 0 \quad \text{and} \quad \sum V_{KB} I_{KA} = 0$$

Where V_{KA}, I_{KA} and V_{KB}, I_{KB} are branch voltages and currents for the two networks A and B respectively.



3. (a) Solve the following LPP problem using Graphical method. Show the feasible region and mark co-ordinates of all corner points.

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Maximize $F = 2x_1 + 6x_2$

Subject to the constraints

$$5x_1 + 9x_2 \leq 45$$

$$-x_1 + x_2 \leq 1$$

$$2x_2 \leq 5$$

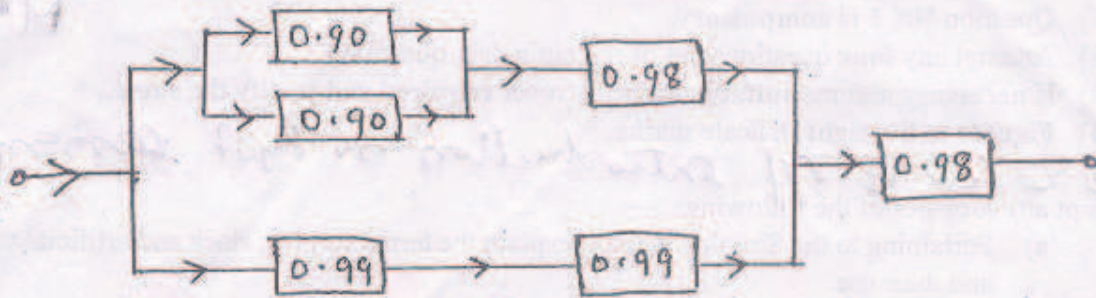
and $x_1, x_2 \geq 0$

(b) Solve the LPP problem in (a) using Simplex method.

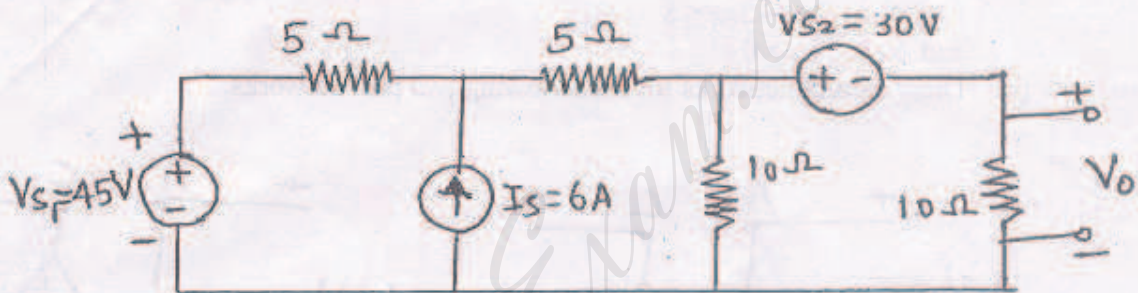
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B. E.T.E. Old Intro. to System Design

4. (a) Explain and define the terms failure rate, failure density, probability of failure, Reliability and MTTF. 10
 (b) Find the reliability of the system consisting of subsystems with the reliabilities as shown in the figure. 10



5. (a) Explain and define the sensitivity for network function. 4
 (b) For the network shown find the sensitivity of output voltage V_0 — 16
 (i) When only current source I_s changes
 (ii) When only voltage source V_{s1} changes.



Use adjoint method.

6. Consider the transportation problem with three sources and four destinations. Source capacities and destination demands are shown in the table. Also mentioned are the unit transportation costs in the brackets. 20

		Destinations				Capacity
		1	2	3	4	
Sources	A	9	2	9	5	25
	B	1	8	5	4	15
	C	8	9	3	6	10
Demand		5	10	15	20	

- Find the transportation cost using—
 (a) North-west corner method
 (b) Least cost method
 (c) Vogel's Approximation method.

7. Write notes on any two of the followings :— 20
 (a) Two phase method of solving Linear Programming Problem.
 (b) Big M method of solving Linear Programming Problem.
 (c) Monte Carlo Simulation.