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Reg. No. : .....

Name : .....

Fifth Semester B.Tech. Degree Examination, December 2015
(2013 Scheme)
13.502 : ENGINEERING MATHEMATICS – V (FR)
(Advanced Mathematics and Queueing Models)

Time : 3 Hours Max. Marks : 100

PART – A

Answer **all** questions. **Each** question carries **4** marks.

1. Define feasible solution and optimal solution in LPP.
2. Write the standard form of LPP.
3. Mathematically state transportation problem.
4. Define the different types of floats in Network Analysis.
5. Briefly explain any one basic queueing model.

PART – B

Answer **any one full** question from **each** Module. **Each** question carries **20** marks.

Module – I

6. a) A firm manufactures 3 products A, B and C. The profits are Rs. 3, Rs. 2 and Rs. 4 respectively. The firm has two machines M_1 and M_2 and below is the required processing time in minutes for each machine on each product.

	Products		
Machines	**A**	**B**	**C**
M_1	4	3	5
M_2	2	2	4

Machines M_1 and M_2 have 2000 and 2500 machine-minutes respectively. The firm must manufacture 100 A's, 200 B's and 50 C's but not more than 150 A's. Formulate an LPP to maximize profit.

b) Find all the basic solutions to the following problem :

Maximize $z = x_1 + 3x_2 + 3x_3$

Subject to $x_1 + 2x_2 + 3x_3 = 4$

$2x_1 + 3x_2 + 5x_3 = 7$

Which of the basic solutions are

i) non-degenerate basic feasible

ii) optimal basic feasible ?

OR

7. a) Solve graphically the following LPP :

Maximize $z = 100x_1 + 40x_2$

Subject to $10x_1 + 4x_2 \leq 2000$

$3x_1 + 2x_2 \leq 900$

$6x_1 + 12x_2 \leq 3000$

$x_1, x_2 \geq 0$

Is the solution unique ? Justify your answer.

b) Use Big – M method to solve :

Minimize $z = 2x_1 + x_2$

Subject to $3x_1 + x_2 = 3$

$4x_1 + 3x_2 \geq 6$

$x_1 + 2x_2 \leq 3$

$x_1, x_2 \geq 0$

Module – II

8. a) Write the dual of the following LPP :

Maximize $z = 3x_1 - 2x_2 + 4x_3$

Subject to $3x_1 + 5x_2 + 4x_3 \geq 7$

$6x_1 + x_2 + 3x_3 \geq 4$

$7x_1 - 2x_2 - x_3 \leq 10$

$x_1 - 2x_2 + 5x_3 \geq 3$

$4x_1 + 7x_2 - 2x_3 \geq 2$

$x_1, x_2 \geq 0$ and x_3 unrestricted.

b) Using duality solve the following problem :

Maximize $z = 0.7x_1 + 0.5x_2$

Subject to $x_1 \geq 4$

$x_2 \leq 6$

$x_1 + 2x_2 \geq 20$

$2x_1 + x_2 \geq 18$

$x_1, x_2 \geq 0$

OR

9. a) A company has three plants at locations A, B and C which supply to warehouses located at D, E, F, G and H. Monthly plant capacities are 800, 500 and 900 units respectively. Monthly warehouse requirements are 400, 400, 500, 400 and 800 respectively. Unit transportation costs (in rupees) are given below :

		To				
		D	E	F	G	H
From	A	5	8	6	6	3
	B	4	7	7	6	6
	C	8	4	6	6	3

Determine an optimal distribution for the company in order to minimize the total transportation cost.

b) Solve the following assignment problem :

	W	X	Y	Z
A	10	12	19	11
B	5	10	7	8
C	12	14	13	11
D	8	15	11	9

Module – III

10. The following table gives the activities in a construction project and time duration :

Activity	Preceeding Activity	Normal time (Days)
1 – 2	–	20
1 – 3	–	25
2 – 3	1 – 2	10
2 – 4	1 – 2	12
3 – 4	1 – 3, 2 – 3	5
4 – 5	2 – 4, 3 – 4	10

i) Draw the network of the project.

ii) Find the total float for each activity.

iii) Determine the critical path and the project duration.

OR