

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular/Backlog), April-May 2015

B. Tech (All Branches), Semester VI



Roll No.....

COURSE CODE: MA 601

Time: 3 hours

Max. Marks: 100

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Use of calculator is not allowed. Be Neat! Be Legible!! All the Best!!!

Q.1A	Objective type multiple choice questions (10 questions @ 1 mark)	10
i.	Normal distribution curve is the example of (a) analouge (b) symbolic (c) both (a) and (b) (d) None of theses	
ii.	In balanced transportation problem with m sources and n destinations, the number of basic variables are (a) m+n (b) m+n+1 (c) m+n-1 (d) None of theses	
iii.	In an IPP, the decision variables are required to be (a) all integers (b) between 0 and 1 (c) only 0 or 1 (d) None of theses	
iv.	If the primal problem has an unbounded solution then its dual has (a) no solution (b) an unbounded solution (c) bounded solution (d) None of theses	
v.	An activity (i,j) is said to be critical if (a) $E_i=L_i$ (b) $E_j=L_j$ (c) both (a) and (b) (d) None of theses	
vi.	The result obtained by simulation is (a) exact (b) unrealistic (c) approximate (d) None of theses	
vii.	To start with the simplex iteration, the starting basis matrix B is (a) I (b) -I (c) zero (d) None of theses	
viii.	Unconstrained extremal problem are the part of (a) IPP (b) LPP (c) DPP (d) None of theses	
ix.	The assignment problem is special case of (a) NLPP (b) LPP (c) both (a) and (b) (d) None of theses	
x.	Dominance principle in game theory (a) reduces the size of the pay-off matrix (b) reduces the game value (c) Both (a) and (b) (d) None of theses	
Q.2	Short answer type questions (4 questions @ 2.5 marks)	10
Q.2A	Explain simulation language.	
Q.2B	Explain the scope of optimization.	
Q.2C	Solve the following game:	



		Player B	
		Strategy 3	Strategy 4
Player A	Strategy 1	4	6
	Strategy 2	3	5

Q.2D Draw a project for following:

Activity	A	B	C	D	E	F	G	H	I	J	K
Preceded by	-	-	A	B	A	B	C,D	G,F	E	H,I	J

Q.3A Construct the dual of the primal problem

$$\begin{aligned} \text{Min. } Z &= 2x_1 + x_2 - x_3 \\ \text{Subject to } x_1 + x_2 + x_3 &\geq 6 \\ x_1 - x_2 &\geq 1 \\ 3x_1 - 2x_2 + 3x_3 &= 3 \\ \text{and } x_1, x_2, x_3 &\geq 0 \end{aligned}$$

05

Q.3B Use Lowest Cost Entry method to solve the following transportation problem

		Destinations			Supply
		1	2	3	
Origin	A	40	25	22	100
	B	44	35	30	30
	C	38	38	28	70
Demand		40	20	60	

05

Q.4A Formulate the given transportation problem in terms of LPP

	R ₁	R ₂	R ₃	R ₄	R ₅	Supply
Origin	X ₁₁	X ₁₂	X ₁₃	X ₁₄	X ₁₅	50
	8	9	10	36	51	
	X ₂₁	X ₂₂	X ₂₃	X ₂₄	X ₂₅	100
	2	12	1	20	1	
	X ₃₁	X ₃₂	X ₃₃	X ₃₄	X ₃₅	150
	1	35	1	3	6	
Demand		100	70	50	40	40

05

Q.4B Solve the following DPP:

$$\begin{aligned} \text{Minimize } Z &= \sum_{i=1}^n y_i^2 \\ \text{Subject to } \prod_{i=1}^n y_i &= b \\ y_i &\geq 0; \quad i = 1, 2, \dots, n \end{aligned}$$

05

Q.5A Solve the following NLPP using Kuhn-Tucker conditions: 05

$$\begin{aligned} \text{Maximize } & Z = 10x_1 + 4x_2 - 2x_1^2 - x_2^2, \\ \text{Subject to } & 2x_1 + x_2 \leq 5 \\ \text{and } & x_1, x_2 \geq 0 \end{aligned}$$

Q.5B Five wagons are available at stations 1, 2, 3, 4 and 5. These are required at five stations I, II, III, IV and V. How should the wagons be transported so as to minimize the total mileage covered? 05

	I	II	III	IV	V
1	10	5	9	18	11
2	13	9	6	12	14
3	3	2	4	4	5
4	18	9	12	17	15
5	11	6	14	19	10



Q.6A Explain mathematical modelling vs. simulation with the help of example. 05

Q.7A Solve the following game by graphically: 05

		Player B			
		1	2	3	4
Player A	1	3	3	4	0
	2	5	4	3	7

Q.7B Find the optimal solution using vogel's method. Also, apply UV method. 10

		Stores				Production capacity
		1	2	3	4	
Factories	A	4	6	8	13	50
	B	13	11	10	8	70
	C	14	4	10	13	30
		9	11	13	8	50
Demand		25	35	105	20	

OR

Q.7B Use dual simplex method to solve LPP 10

$$\begin{aligned} \text{Max. } & Z = -3x_1 - 2x_2 \\ \text{Subject to } & x_1 + x_2 \geq 1 \\ & x_1 + x_2 \leq 7 \\ & x_1 + 2x_2 \geq 10 \\ & x_2 \leq 3 \\ \text{and } & x_1, x_2 \geq 0 \end{aligned}$$

Q.8A Solve the following problem by the revised simplex method: 10

$$\begin{aligned} \text{Max. } & Z = 6x_1 - 2x_2 + 3x_3 \\ \text{Subject to } & 2x_1 - x_2 + 2x_3 \leq 2 \\ & x_1 + 4x_3 \leq 4 \\ \text{and } & x_1, x_2, x_3 \geq 0 \end{aligned}$$

Q.9A Using branch and bound technique solve the following IPP 10

$$\text{Min. } Z = 4x_1 + 3x_2$$



Subject to $5x_1 + 3x_2 \geq 30$

$$x_1 \leq 4$$

$$x_2 \leq 6$$

$x_1, x_2 \geq 0$ and integers.

Q.9B Solve by simplex method the following LPP

10

$$\text{Min. } Z = x_1 - 3x_2 + 3x_3$$

Subject to $3x_1 - x_2 + 2x_3 \leq 7$

$$2x_1 + 4x_2 \geq -12$$

$$-4x_1 + 3x_2 + 8x_3 \leq 10$$

and $x_1, x_2, x_3 \geq 0$

OR

Q.9B, A project has a following time estimates

10

Activity	Estimated durations (days)		
	Optimistic (t_o)	Most Likely (t_m)	Pessimistic (t_p)
1-2	1	1	7
1-3	1	4	7
1-4	2	2	8
2-5	1	1	1
3-5	2	5	14
4-6	2	5	8
5-6	3	6	15

- Draw the project network and identify all the paths through it.
- Find the critical path.
- Determine the expected project length.
- Find the probability that the project is completed in 19 weeks.