

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Backlog), November 2017

B. Tech, Semester V

Roll No.....

COURSE CODE: MA 502

Time: 3 hours

Max. Marks: 100

COURSE NAME: Optimization Technique

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.

Q.1A	Objective type multiple choice questions (10 questions @ 1 mark)	10
i.	The assignment problem is a special case of; (a) non-linear programming problem (b) a transportation problem (c) a quadratic programming problem (d) none of these	
ii.	Given an activity's optimistic, most likely, and pessimistic time estimates of 6, 10, 14 days, respectively, the PERT time for this activity is; (a) 5 (b) 10 (c) 7 (d) 12	
iii.	In project nodes are connected by (a) circuit (b) walk (c) path (d) None of theses	
iv.	KT conditions are used for (a) LPP (b) DPP (c) IPP (d) NLPP	
v.	To solve linear programming problem we use (a) simplex algorithm (b) transportation algorithm (c) hungarian algorithm (d) None of theses	
vi.	In primal-dual solutions, dual problem solution can be obtained by solving other problems classified as (a) unrestricted problem (b) original problem (c) double problem (d) restricted problem	
vii.	Optimization simply helps in improving the.....of the solution but does not result in a perfect solution. (a) quality (b) clarity (c) look (d) None of theses	
viii	Special simulation languages are useful because they (a) Reduce programme preparation time & cost (b) Require no prior programming knowledge (c) Have the capability to generate random variables (d) All of theses	
ix	If the total supply is less than the total demand, a dummy row is included in the cost matrix with..... (a) dummy demand (b) dummy supply (c) zero cost (d) both A and B	
x	Which of the following characteristics apply to queueing system (a) Customer population (b) arrival process (c) both (a) and (b) (d) None of theses	
Q.2	Short answer type questions (4 questions @ 2.5 marks)	10

- Q.2A Discuss the advantages and disadvantages of optimization.
 Q.2B Explain the requirements and characteristics of good project.
 Q.2C State the Kuhn-Tucker conditions.
 Q.2D Suggest the suitable model (whether iconic, analogue or symbolic) for the following: (a) microfilmed documents, (b) flow process chart in an organization, (c) forecast model and (d) monogram

- Q.3A Write the flow chart to solve the Assignment problems. 05
 Q.3B Solve the following NLPP and check whether it maximizes or minimizes: 05

$$\begin{array}{ll} \text{Optimize} & Z = x_1^2 - 10x_1 + x_2^2 - 6x_2 + x_3^2 - 4x_3, \\ \text{Subject to} & x_1 + x_2 + x_3 = 7 \\ \text{and} & x_1, x_2, x_3 \geq 0 \end{array}$$

- Q.4A Derive M/M/1:FCFS model. 05
 Q.4B Construct a network for the project whose activities and their precedence relationship are given below: 05

Activity	A	B	C	D	E	F	G	H	I	J	K
Immediate Predecessor		A	A	C	B, C	D, E	E	G	D, F	I, H	J

- Q.5A Solve the following game using principle of dominance 05

	B ₁	B ₂	B ₃	B ₄	B ₅
A ₁	1	3	2	7	4
A ₂	3	4	1	5	6
A ₃	6	5	7	6	5
A ₄	2	0	6	3	1

- Q.5B What is model? Explain the importance of modelling in optimization with the help of an application. 05
 Q.6A Solve the following assignment problem to get minimize cost: 05

	I	II	III	IV	V
1	11	17	8	16	20
2	9	7	12	6	15
3	13	16	15	12	16
4	21	24	17	28	26
5	14	10	12	11	13

- Q.7A Explain Monte Carlo simulation with real life application. 05
 Q.7B Yadav food company is developing a low-calorie high-protein diet supplement called Hi-pro. The specifications for Hi-pro have been established by a panel of medical experts. These specifications along with the calorie, protein and vitamin content of three basic foods, are given in the following table: 10

Nutritional Elements	Units Of Nutritional Elements			Basic Foods Hi-pro specifications
	1	2	3	
Calories	250	650	100	300
Proteins	150	100	150	200
Vitamin A	50	150	75	100
Vitamin C	15	125	650	100
Cost per serving (Rs.)	1.50	2.00	1.20	

What quantities of foods 1, 2, and 3 should be used? Formulate and solve this problem as an LPP to minimize cost of serving. ' .

OR

Q.7B Using the method of Lagrangian multipliers, solve the NLPP 10

$$\text{Maximize } Z = 6x_1 + 8x_2 - x_1^2 - x_2^2$$

Subject to the constraints $4x_1 + 3x_2 = 16$, $3x_1 + 5x_2 = 15$

and $x_1, x_2 \geq 0$

Q.9A Use revised simplex method to solve the following: 10

$$\text{Maximise } Z = 6x_1 + 3x_2 + 4x_3 - 2x_4 + x_5$$

s. to. $2x_1 + 3x_2 + 3x_3 + x_4 = 10$

$$x_1 + 2x_2 + x_3 + x_5 = 8$$

and $x_1, x_2, x_3, x_4, x_5 \geq 0$

Q.9B Draw the network diagram for following data: 10

Activity	(1, 2)	(1, 3)	(2, 4)	(3, 4)	(3, 5)	(4, 5)	(4, 6)	(5, 6)
Time	6	5	10	3	4	6	2	9

Also, determine the critical path for the given data.

OR

Q.9B A manufacturing firm has three plants A, B and C and three warehouses as 10
Mumbai, Nagpur and Bangalore. Their capacities and requirements are shown in Table below:

Plants	Capacity	Warehouse	Requirement
A	40	Mumbai	55
B	50	Nagpur	45
C	40	Bangalore	30

The transportation costs in Rupees from plants to warehouses are s given below:

From \ TO	Mumbai	Nagpur	Bangalore
A	11	9	6
B	12	14	11
C	10	18	10

There is no other condition, any plant can transport the product to any warehouses upto its requirement. Apply north west corner rule to minimize the total transportation costs.