

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular), November 2016

B. Tech (CSE+ECE), Semester V

Roll No.....

COURSE CODE: MA 502

Time: 3 hours

Max. Marks: 100

COURSE NAME: Optimization Techniques

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. Be neat!! Be clean!! All the best!!!!
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Q.1A Objective type multiple choice questions (10 questions @ 1 mark) 10

- i. Raw material is a part of
(a) direct inventory (b) indirect inventory (c) both (a) and (b) (d) None of theses
- ii. Mr. Allan arrives at pizza counter and seeing the long queue, decide not to join the queue. The behavior of Mr. Allan is refer as
(a) balking (b) reneging (c) jockeying (d) None of theses
- iii. Motion Film is the example of
(a) Iconic (b) Symbolic (c) both (a) and (b) (d) None of theses
- iv. Simulation models can be solved
(a) inventory models (b) queueing models (c) both (a) and (b) (d) None of theses
- v. If there were n workers & n jobs there would be
(a) $n!$ solutions (b) n solutions (c) $n-1!$ solutions (d) None of theses
- vi. According to the _____, the defensive player will select the strategy that has the smallest of the maximum payoffs
(a) maximax strategy (b) minimin strategy (c) maximin strategy (d) None of theses
- vii. 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
- viii. Which of the following characteristics apply to queueing system
(a) Customer population (b) arrival process (c) both (a) and (b) (d) None of theses
- ix. 'No passing rule' is related with ;
(a) transportation models (b) assignment models (c) sequencing models (d) None of theses
- x. The solution to a transportation problem with ' m ' rows (supplies) & ' n ' columns (destination) is feasible if number of positive allocations are
(a) $m+n$ (b) $m*n$ (c) $m+n-1$ (d) $m+n+1$

Q.2 Short answer type questions (4 questions @ 2.5 marks)

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- Q.2A Explain optimization. Discuss advantages and disadvantages of optimization.
- Q.2B Define project. Also, explain the requirements and characteristics of good project.
- Q.2C 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, (d) monogram, (e) motion film
- Q.2D Supporters arrive at an administrator counter at an average inter-arrival rate of 2 minutes. The administrator in duty takes an average of one minute per supporter. What is average waiting time of a Supporter?

Q.3A Derive (M/M/1): (FCFS/ ∞ / ∞) model.

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Q.3B Write a short note on Monte Carlo simulation. Also, discuss its applications.

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Q.4A Reduce the following game by dominances and find the value of the game.

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		Player B			
		I	II	III	IV
Player A	1	3	2	4	0
	2	3	4	2	4
	3	4	2	4	0
	4	0	4	0	8

Q.4B Use dynamic programming to solve

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$$\begin{aligned} \text{Min. } Z &= u_1 u_2 \dots u_n \\ \text{s. to } u_1 + u_2 + \dots + u_n &= c \\ \text{and } u_i &\geq 0, i=1, 2, \dots, n \end{aligned}$$

Q.5A A firm works 60 hours and has a capacity of overtime work to the extent of 20 hours in a week. It has received 7 orders to be processed on 3 machines A, B, and C in order A, B, C to be delivered in a week's time from now. The process times (in hours) are recorded in the following table.

Job	1	2	3	4	5	6	7
Machine A	7	8	6	6	7	8	5
Machine B	2	2	1	3	3	2	4
Machine C	6	5	4	4	2	1	5

The manager, who in fairness insists on performing the jobs in the sequence in which they are received, is refusing to accept an eight order according to him eight job would require a total of 61 hours for processing, which exceeds the firm's capacity. What is your advice to him?

Q.5B Explain EOQ problem with no shortages.

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Q.6A ALMER MALAYSIA 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:

Nutritional Elements	Units Of Nutritional Elements			Basic Foods Hi-pro specifications
	1	2	3	
Calories	350	250	200	300
Proteins	250	300	150	200
Vitamin A	100	150	75	100
Vitamin C	75	125	150	100
Cost per serving (Rs.)	1.50	2.00	1.20	

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

- Q.7A A company has a team of four salesmen and four districts where the company wants to start its business. After taking into account the capabilities of salesmen and nature of districts, the company estimates that profit per day in Rs. for each salesman in each district is as follows: 05

	District			
	A	B	C	D
1	16	10	14	11
2	14	11	15	15
3	15	15	13	12
4	13	12	14	15

Find the assignment of salesmen to various districts which yield maximum profit.

- 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 $x_1, x_2 \geq 0$

OR

- Q.7B Write various simulation languages. Also, discuss 'ARENA' with the help of example. 10

- Q.8A Use revised simplex method to solve the following: 10

$$\text{Maximize } Z = x_1 + x_2 + 3x_3$$

s. to. $3x_1 + 2x_2 + x_3 \leq 3$

$$2x_1 + x_2 + 2x_3 \leq 2$$

and $x_1, x_2, x_3 \geq 0$

- Q.9A A contractor identifies 12 tasks in a project with the following precedence restrictions and durations: 10

Task	A	B	C	D	E	F	G	H	I	J	K	L
Predecessors	-	-	A	B,C	D	E	B,C	F,G	F,G	H,I	B	F,G,K

Time Period (In Days)	30	7	10	14	10	7	21	7	12	15	30	15
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- (a) Draw the network for the above project.
(b) Determine the early and late start and finish times for all the tasks.

Q.9B A dairy firm has three firms located throughout a state. Daily milk production at each plant is as follows: 10

Plant 1- 3 million liters; Plant 2- 12 million liters; Plant 3- 8 million liters;

Each day the firm must fulfil the needs of its four distribution centers. Minimum requirement at each center is as follows:

Distribution center 1- 7 million liters; Distribution center 2- 5 million liters;

Distribution center 3- 9 million liters; Distribution center 4- 2 million liters;

Cost of shipping one million liter of the milk from each plant to each distribution center is given in the following table in hundreds of rupees.

Plants	Distribution Centers				
		1	2	3	4
	1	2	3	11	7
	2	12	10	6	1
	3	5	8	15	9

The dairy firm wishes to decide as to how much should be the shipment from which plant to which distribution center so that the cost of shipment may be minimum. Also, find the solution using u-v method.

OR

Q.9B Solve the following LPP using its dual

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$$\text{Max } Z = 5x_1 - 2x_2 + 3x_3$$

$$\text{Subject to } 2x_1 + 2x_2 - x_3 \geq 2, \quad 3x_1 - 4x_2 \leq 3, \quad x_2 + 3x_3 \leq 5$$

$$\text{and } x_1, x_2, x_3 \geq 0$$