

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular), May-2019

B. Tech (CSE/CSE(IBM)), Semester IV

Roll No.....

COURSE CODE: MA 403

Time: 2 hours

Max. Marks: 30

COURSE NAME: Engineering Optimization

Instructions to students:

1. Do not write anything other than your roll number on question paper. Assume suitable data wherever required and mention it clearly. Be neat!! Be clean!! All the best!!!!

- Q.1 The Evergreen Fertilizer Company produces two types of fertilizers, Fastgro and Super Two. The company has developed the following nonlinear programming model to determine the optimal number of bags of Fastgro and Super Two that they must produce each day to maximize profit, given a constraint for available potassium: 06

$$\text{Max } Z = 30x_1 - 2x_1^2 + 25x_2 - 0.5x_2^2$$

subject to

$$3x_1 + 6x_2 = 300lb$$

Determine the optimal solution to this nonlinear programming model.

- Q.2 A manufacturing company process six different jobs on two machines namely printing and packaging. Number of jobs and its processing times on printing and packaging are 5, 16, 6, 3, 9, 6 and 8, 7, 11, 5, 7.5, 14, respectively in hours. Formulate the sequencing problem then determine optimum sequence, total minimum elapsed time and idle time for each machines. 06

- Q.3 Two companies namely Lakshmi Cement and Ambuja Cement share the bulk of the market for a particular kind of product. Each is now planning its new marketing plans for the next year in an attempt to wrest some sales away from the other company. Each company is considering three possibilities: (1) better packaging of the product, (2) increased advertising, and (3) a slight reduction in price. The costs of the three alternatives are quite comparable and sufficiently large that each company will select just one. The estimated effect of each combination of alternatives on the increased percentage of the sales for Lakshmit Cement 1 is as follows: 07

		Player 1		
		1	2	3
Strategy	1	2	3	1
	2	1	4	0
	3	3	-2	-1

Each company must make its selection before learning the decision of other company.

- (a) Without eliminating dominated strategies, use minimax criterion to determine the best strategy for each company.
- (b) Identify and eliminate dominated strategies as far as possible. Then show the resulting reduced payoff table with no remaining dominated strategies and find the solution.

Q.4 State the Kuhn-Tucker conditions. Write down the Kuhn-Tucker conditions to get an optimal solution of the following Non-linear programming problem: 05

$$\text{Minimize } Z = 2x_1 + 3x_2 - x_1^2 - 2x_2^2$$

Subject to: $x_1 + 3x_2 \leq 6$, $5x_1 + 2x_2 \leq 10$ and $x_1, x_2 \geq 0$

Q.5 Baroda Bank always has two tellers on duty. Customers arrive to receive service from a teller at a mean rate of 40 per hour. A teller requires an average of 2 minutes to serve a customer. When both tellers are busy, an arriving customer joins a single line to wait for service. Experience has shown that customers wait in line an average of 1 minute before service begins. 06

(a) Describe why this is a queueing system.

(b) Determine the basic measures of performance- W_q , W , L_q and L .