Sanjay Ghodawat University, Kolhapur 2019-20

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Year and Program: 2019-20 **School of Technology** **Department of Civil Engineering**

Course Code: CET523R1 **Course Title: Operation Research** **Semester – M. Tech. Sem I**

Day and Date: Saturday 28/12/19 **End Semester Examination (ESE)** **Time:** 3hr 10.30am to 1.30pm **Max Marks: 100**

Instructions:
1) All questions are compulsory.
2) Assume suitable data wherever necessary.
3) Figures to the right indicate full marks.

		Marks	Bloom's Level	CO
Q.1	**Attempt the following**			
a)	Discuss role of operation research in Civil Engineering. Explain characteristics of a good model in operation research.	07	L_3	CO1
	OR			
a)	Describe six phases in operation research.	07	L_3	CO1
b)	Solve following LPP by using graphical method Maximize, $z = 2x_1 + x_2$ Subject to, $x_1 + 2x_2 \le 10$ $x_1 + x_2 \le 6$ $x_1 - x_2 \le 2$ $x_1 - 2x_2 \le 1$ $x_1, x_2 \ge 0$	08	L_3	CO2
	OR			
b)	Solve following LPP by using Simplex method Maximize, $z = 4x_1 + 6x_2$ Subject to, $-x_1 + x_2 \le 11$ $x_1 + x_2 \le 27$ $2x_1 + 5x_2 \le 90$ $x_1, x_2 \ge 0$	08	L_3	CO2

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Q.2 **Attempt the following**

a) Explain following terms: 07 L_3 CO3

1) What is meant by non-linear programming?

2) Local and global optimum

OR

a) Explain deterministic and probabilistic modes with examples. 07 L_3 CO3

b) A company is considering is considering the feasibility of changing e supplier for coupling hardware. Presently the company has an optimal purchasing policy with Ace Hardware at a discount of 1%. Current yearly purchases are Rs. 81,000/- and the administrative charges are Rs. 125/- per purchase and the carrying charges are 25% of the average inventory level. 08 L_4 CO3

Bids received from other suppliers are: Nut co. offered 5% discount if ordered twice a year and Grabbers co. offers 3% if ordered four times a year. Should the company retain the present supplier or accept the proposed offers and, if so, which offer?

OR

b) A company manufactures two products A and B on two machines. Whatever is manufactured is sold in the market, as the market for the product is good. The capacities of the machines are limited to produce daily 80 units of product A and 60 units of product B. The raw material supply required for the product is limited to produce 600 units per day. The labour required is 160 man-days and the organization has 160 men on the roll. The production of A requires one man day hour of labour and that of product B is 2 man day hour. The company's objective is to maximize the total profit if the sales–price relationships are as given below. 08 L_3 CO3

Product	Unit Price	Demand of A and B	Cost function
A	P1	$1500\text{-}5P_1$	$200a + 0.1a^2$
B	P2	$3800\text{-}10P_2$	$300b + 0.1b^2$

In the above table a and b are the number of units of A and B produced,

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respectively. This can also be written as: a = 1500-5P_1 and b = 3800-10P_2. Formulate the NLPP.

Q.3 **Solve any Two**

a)	Discuss difficulties or limitations in a model in operation research.	08	L_2	CO1
b)	Explain sensitivity analysis.	08	L_3	CO2
c)	Illustrate types of non-linear programming problems.	08	L_2	CO3
d)	Mention and explain classification of inventories.	08	L_3	CO4

Q.4 **Solve any Two**

a) Find initial basic feasible solution by NW corner method and VAM. 09 L_3 CO3

		1	2	3	4	Supply
Plants	1	2	3	11	7	6
	2	1	0	6	1	01
	3	5	8	15	9	10
Requirement		7	5	3	2	

b) A plant manager has four subordinates, and four tasks to be performed. The subordinates differ in efficiency and the tasks differ in their intrinsic difficulty. This estimate of the times each man would take to perform each task is given in the effectiveness matrix below. 09 L_3 CO3

	I	II	III	IV
A	8	26	17	11
B	13	28	4	26
C	38	19	18	15
D	19	26	24	10

c) What are steps in decision theory? 09 L_3 CO3

Q.5 **Solve any Two**

a) Six jobs A, B, C, D, E, and F have arrived at one time to be processed on a single machine (Table 1). Assuming that no new jobs arrive thereafter, determine: 09 L_3 CO4

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a. Optimal sequence as per SPT rule
b. Completion times of the jobs
c. Mean flow time
d. Average in flow inventory

Table 1: Job and processing time

Job	A	B	C	D	E	F
Processing time (Minutes)	7	6	8	4	3	5

b) Explain Decision tree. Explain advantages and limitations of decision tree approach. 09 L_3 C

c) Explain in detail: 09 L_3 C
   a. Decision making under certainty
   b. Decision making under uncertainty

Q.6 **Solve any Three**

a) Explain application of queuing theory in Civil Engineering. 06 L_2 CO

b) Explain 'maximin' and 'minimax' criteria in decision theory. 06 L_2 CO

c) Define: Game, player, play, strategy, pure strategy, mixed strategy, optimal strategy, 06 L_2 CO

d) Explain waiting time and idle costs in queuing theory. 06 L_2 CO

*** End ***

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