U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

May 2023 Semester End Make-Up Examinations

Programme: B.E. **Semester: VII**
Branch: Institutional Elective **Duration: 3 hrs.**
Course Code: 21MD7IEOPR **Max Marks: 100**
Course: Operations Research **Date: 17.05.2023**

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1 a) Briefly explain phases of O R **10**

b) Use simplex method to solve: Maximize $Z = 3X_1 + 4X_2$ subject to $3X_1 + 2X_2 \leq 6$, $2X_1 + 4X_2 \leq 8$ and $X_i \geq 0$ **10**

OR

2 a) Solve the following problem by simplex method: Maximize $Z = 2X_1 + 3X_2$ subject **10**

$5X_1 + 3X_2 = 15$, $4X_1 + 5X_2 = 20$ and $X_i \geq 0$

b) Use simplex method to solve: Maximize $Z = 6X_1 + 4X_2$ subject to $2X_1 + 3X_2 \leq 6$, $6X_1 + 3X_2 \leq 12$ and $X_i \geq 0$ **10**

UNIT - II

3 a) Differentiate between transportation problem and assignment problem **06**

b) Obtain the optimal solution for the following transportation problem using North West Corner method. **14**

Table 1

	A	B	C	D	Capacity
R1	12	14	18	15	250
R2	15	18	16	13	300
R3	18	19	15	14	350
Required	200	225	275	250	

UNIT - III

4 a) A company has five jobs to be done. The following matrix (**table 2)** shows the returns in Rupees on assigning i^{th} machine to j^{th} job. Assign the five jobs to the five machines. **10**

b) A travelling salesman has to visit 5 cities. He wishes to start from a particular city, visit each city once and then return to his starting point. Cost of going from one city to another is shown in **table 3**. Find the least cost route and the optimal cost. **10**

Table 2

	Jobs					
Persons		**1**	**2**	**3**	**4**	**5**
	A	11	5	12	4	5
	B	4	2	3	5	2
	C	12	3	14	6	3
	D	14	6	11	7	6

Table 3

	City					
City		**A**	**B**	**C**	**D**	**E**
	A	-	8	6	7	9
	B	6	-	7	9	8
	C	8	7	-	6	5
	D	7	5	9	-	6
	E	5	6	8	9	-

UNIT - IV

5 a) Differentiate between PERT and CPM **06**

b) A project schedule has the following characteristics as shown in table 4. (i) Construct the project network, (ii) identify the critical path and project duration (iii) compute EST, EFT, LST, LFT, total float and free float for each activity **14**

Table 4

Activity	1-2	1-3	2-4	3-4	3-5	4-9	5-6	5-7	6-8	7-8	8-10	9-10
Time (days)	4	2	1	4	6	5	4	8	2	3	5	7

OR

6 a) Define Total Float, Independent Float, Free Float, Optimistic time, Most likely time and Pessimistic time **06**

b) A project schedule has the following characteristic shown in table 5. **14**
(i) Construct the project network (ii) find the expected time and variance of the activities
(iii) Identify the critical path and expected project duration (iv) what is the probability of completing the project in 30 days schedule time (v) what is the probability of completing 3 days earlier than expected (vi) what is the probability that will not be completed one day later than the expected (vii) what due date 90% of chance of being met

Table 5

Activity	1-2	2-3	2-4	3-5	4-5	4-6	5-7	6-7	7-8	7-9	8-10	9-10
Tm	2	2	3	4	3	5	5	7	4	6	2	5
To	1	1	1	3	2	3	4	6	2	4	1	3
Tp	3	3	5	5	4	7	6	8	6	8	3	7

UNIT - V

7 a) Use the relation of dominance to solve the game whose payoff matrix is given in table 6 **10**

b) Consider the payoff matrix of player A as shown in table 7. Solve it optimally using graphical method **10**

Table 6

		Player B					
		I	**II**	**III**	**IV**	**V**	**VI**
Player A	**I**	16	14	11	10	15	16
	II	12	18	13	12	14	17
	III	10	13	12	10	11	15
	IV	11	15	10	13	12	14
	V	12	17	17	15	16	18
	VI	12	10	11	14	12	13

Table 7

		Player B					
		1	**2**	**3**	**4**	**5**	**6**
Player A	**1**	4	3	6	1	5	2
	2	8	5	7	1	6	4
	3	1	4	2	3	5	1
	4	9	6	8	7	6	5
	5	7	5	4	8	9	6
	6	2	3	4	7	1	5

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