CBCS SCHEME

USN

22MBA24

Second Semester MBA Degree Examination, Dec.2025/Jan.2026
Operations Research

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FOUR full questions from Q.No.1 to Q.No.7.
2. Question No. 8 is compulsory.
3. M : Marks , L: Bloom's level , C: Course outcomes.
4. Statistical Tables allowed.

			M	L	C
Q.1	**a.**	What is the difference between infeasible and unbounded solution?	**3**	**L1**	**CO1**
	b.	Explain the various quantitative methods that are useful for decision making under uncertainty.	**7**	**L1**	**CO2**
	c.	Determine the initial basic feasible solution to the following transportation problem using i) NWCM ii) LCM iii) VAM.	**10**	**L2**	**CO2**

Destination

		D_1	D_2	D_3	D_4	Supply
Source	A	11	13	17	14	250
	B	16	18	14	10	300
	C	21	24	13	10	400
Demand		200	225	275	250	

Q.2	**a.**	Define OR (Operations Research).	**3**	**L1**	**CO1**
	b.	Five men are available to do five different jobs. From the past records, the time in hours that each man takes to do each job is known and is given in the following table :	**7**	**L3**	**CO2**

Job

Men	I	II	III	IV	V
A	2	9	2	7	1
B	6	8	7	6	1
C	4	6	5	3	1
D	4	2	7	3	1
E	5	3	9	5	1

Find out how men should be assigned the jobs in way that will minimize the total time taken.

	c.	An architect has been awarded a contract to prepare plans for an urban renewal project. The job consists of the following activities and their estimated times :	**10**	**L3**	**CO2**

Activity	Description	Immediate Predecessors	Time in days
A	Prepare Preliminary sketches	-	2
B	Outline specification	-	1
C	Prepare drawings	A	3
D	Write specifications	A, B	2
E	Run off prints	C, D	1
F	Have specifications	B	3
G	Assemble the bid package	E, F	1

i) Draw the network diagram of activities for the project.
ii) Indicate the critical path.

Q.3	**a.**	What is Degeneracy?	**3**	**L1**	**CO1**
	b.	Explain the guidelines for formulation of linear programming model.	**7**	**L1**	**CO2**
	c.	There are six jobs, each of which must go through machines A, B and C in the order of ABC. Processing time in hours are given in the following table. Determine the sequence of five jobs that will minimize the elapsed time t.	**10**	**L3**	**CO3**

Job	1	2	3	4	5	6
Machine A	8	3	7	2	5	1
Machine B	3	4	5	2	1	6
Machine C	8	7	6	9	10	9

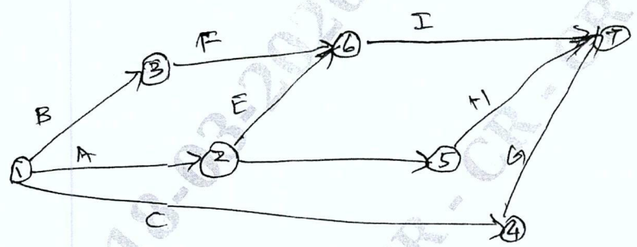
Q.4	**a.**	What is Float? List the various types of floats.	**3**	**L1**	**CO1**
	b.	What are the phases in operations research approach to problem solving?	**7**	**L2**	**CO3**
	c.	Solve the following game graphically :	**10**	**L3**	**CO3**

Player B

		B_1	B_2
	A_1	1	2
	A_2	4	5
Player A	A_3	9	-7
	A_4	-3	-4
	A_5	2	-1

Q.5	**a.**	What are the limitations of graphical problems?	**3**	**L2**	**CO1**

	b.	A manufacturing company is engaged in producing three types of products A, B and C. The production department produces, each day, components sufficient to make 50 units of A, 25 units of B and 30 units of C. The management is confronted with the problem of optimizing the daily production of the products in the assembly department, where only 100 man hours are available daily for assembling the products. The following additional information is available : Type of the product | Profit contribution per unit | Assembly Time / product A | 12 | 0.8 B | 20 | 1.7 C | 45 | 2.5 The Company has a daily order commitment for 20 units of products A and a total of 15 units of products B and C. Formulate this problem as LP model so as to maximize profit.	**7**	**L3**	**CO3**
	c.	Explain the methodology of operations research.	**10**	**L2**	**CO1**
Q.6	**a.**	What is the dominance rule in game theory?	**3**	**L1**	**CO1**
	b.	Explain the phases of project management.	**7**	**L1**	**CO4**
	c.	Apply MODI method to obtain the optimal solution of the transportation problem using following data : | | D_1 | D_2 | D_3 | D_4 | Supply | | S_1 | 19 | 30 | 50 | 10 | 7 | | S_2 | 70 | 30 | 40 | 60 | 9 | | S_3 | 40 | 8 | 70 | 20 | 18 | | Demand | 5 | 8 | 7 | 14 | |	**10**	**L3**	**CO3**
Q.7	**a.**	What is a Closed Loop?	**3**	**L1**	**CO1**
	b.	Discuss the guidelines on linear programming model formulation.	**7**	**L2**	**CO3**
	c.	Use the graphical method to solve the following LP problem. Maximize $Z = 15x_1 + 10x_2$ Subjected to the constraints $4x_1 + 6x_2 \leq 360$ $3x_1 + 0x_2 \leq 180$ $0x_1 + 5x_2 \leq 200$ $x_1, x_2 \geq 0$	**10**	**L3**	**CO3**

Q.8		The following network diagram represents the activities associated with a project : | Activities | A | B | C | D | E | F | G | H | I | | t_o | 5 | 18 | 26 | 16 | 15 | 6 | 7 | 7 | 3 | | t_p | 10 | 22 | 40 | 20 | 25 | 12 | 12 | 9 | 5 | | t_m | 8 | 20 | 33 | 18 | 20 | 9 | 10 | 8 | 4 |  Determine the following : i) Expected completion time and variance of each activity. ii) The Earliest and latest expected completion of each event. iii) Critical path iv) The probability of expected completion time of the project if the original scheduled time of the completing the project is 41.5 weeks. v) Duration of the project that will have 95% chance of being completed.	**20**	**L3**	**CO4**

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