CBCS SCHEME

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22MBA24

Second Semester MBA Degree Examination, June/July 2024
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. *Tables allowed.*
4. *M : Marks , L: Bloom's level , C: Course outcomes.*

			M	L	C
Q.1	a.	Define Operations Research.	3	L2	CO1
	b.	Give applications of Linear programming problem in management.	7	L3	CO2
	c.	A mutual fund company has Rs.20 lakhs available for investment in government bonds, blue chip stocks, speculative-stocks and short-term deposits. The annual expected return and risk factors are given below :	10	L4	CO3

Type of Investment	Annual expected return in percentage (%)	Risk factor (0 to 100)
Govt. Bonds	14	12
Blue chip stocks	19	24
Speculative stocks	23	48
Short term deposits	12	6

Mutual fund is required to keep at least Rs.2 lakhs in short-term deposits. The average risk factors should not exceed more than 42. Speculative stocks must be at most 20 percent of the total amount invested. How should mutual fund invest the funds so as to maximize its total expected annual return? Formulate a Linear Programming problem.

Q.2	a.	What are the limitations in LPP?	3	L2	CO1
	b.	Write down different steps in Decision Making process.	7	L3	CO2
	c.	Use graphical method to solve the following L.P. problem, Minimize $z = 20x_1 + 10x_2$ Subject to constraints $x_1 + 2x_2 \leq 40$ $3x_1 + x_2 \geq 30$ $4x_1 + 3x_2 \geq 60$ where $x_1, x_2 \geq 0$	10	L4	CO3
Q.3	a.	What is an unbalanced case in a transportation model?	3	L2	CO1
	b.	Illustrate the basic feasible solution for the following transportation problem using NWCM.	7	L4	CO2

Origin	Destination				Supply
	I	II	III	IV	
A	4	6	8	13	50
B	13	11	10	8	70
C	14	4	10	13	30
D	9	11	13	8	50
Demand	25	35	105	20	

	c.	Use Vogel's Approximation Method (VAM) to find initial basic feasible solution for the following transportation problem.	10	L4	CO3

	D_1	D_2	D_3	D_4	Supply
S_1	7	14	8	12	400
S_2	9	10	12	5	300
S_3	11	6	11	4	300
Demand	200	450	300	250	

Q.4	a.	What is Saddle point in game theory?	3	L3	CO2
	b.	A company management and the labour union are negotiating a new three year settlement. Each of these has 4 strategies. The costs to the company are given for every pair of strategy choice.	7	L4	CO3

Union Strategies	Company strategies			
	I	II	III	IV
I	20	15	12	25
II	25	14	8	10
III	40	2	10	5
IV	-5	4	11	0

What strategy will the two sides adopt? Also determine the value of the game.

	c.	Provide the optimal job sequencing involving three machines M_1, M_2, M_3 in the order of M_1, M_2 and M_3 for the following data?	10	L5	CO5

Job

Machine	J_1	J_2	J_3	J_4	J_5
M_1	7	12	11	9	8
M_2	8	9	5	6	7
M_3	11	13	9	10	14

Find out the elapsed time (Total time to complete) and IDLE times for all machines?

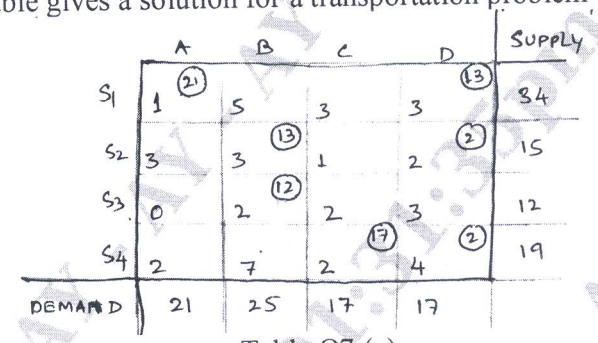
Q.5	a.	What are the limitations of graphical problems?	3	L3	CO2
	b.	Solve the following game using graphical approach. Find the value of the game.	7	L4	CO3

B's strategy

A's strategy	B_1	B_2	B_3	B_4
A_1	8	5	-7	9
A_2	-6	6	4	-2

	c.	Construct a network diagram for the following project whose activities, precedence relationship and duration of each activity is given below. Also find the critical path and completion time of the project and critical activities.	10	L4	CO3

Activities	A	B	C	D	E	F	G	H	I
Preceding Activities	-	-	-	A	A	B, D	C	B	F, G
Time (Days)	23	8	20	16	24	18	19	4	10

Q.6	a.	What are Looping and Dangling errors in Networking?	3	L2	CO1
	b.	A computer centre has three expert programmers. The centre wants three applications program to be developed. Estimates of the computer time in minutes required by the experts for the application program as follows : Programers Programms: 1 (A 120, B 100, C 80); 2 (A 80, B 90, C 110); 3 (A 110, B 140, C 120) Assign the programmers to the programmes in such a way that the total computer time is minimum.	7	L3	CO2
	c.	Solve by algebraic method the following game problem, Player B Player A: A_1 (B_1 3, B_2 4, B_3 0); A_2 (5, 0, 8)	10	L4	CO3
Q.7	a.	Write any three assumptions under sequencing problem.	3	L2	CO1
	b.	Distinguish between PERT and CPM method.	7	L3	CO2
	c.	Following table gives a solution for a transportation problem :  Table Q7 (c) Is the above solution optimal? Justify your answer.	10	L4	CO3
Q.8		**Case Study:**			
	a.	From the following information draw a network diagram, and calculate E_S, E_f, L_S, L_f and Total float. Activity: a, b, c, d, e, f Immediate Predecessor: -, -, a, b, a, d, c, e Duration: 3, 14, 3, 7, 4, 10	10	L4	CO3
	b.	Find the optimal assignment schedule for the following : Note that M_2 cannot be placed at C and M_3 cannot be placed at A. Machines: A, B, C, D, E M_1: 9, 11, 15, 10, 11 M_2: 12, 9, -, 10, 9 M_3: -, 11, 14, 11, 7 M_4: 14, 8, 12, 7, 8	10	L4	CO3

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