Code: 21E00205

MBA II Semester Regular & Supplementary Examinations July 2024
OPERATIONS RESEARCH
(Common to MBA, Business DA & Big DA)

Time: 3 hours **Max. Marks: 60**

All questions carry equal marks
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SECTION-A
(Answer the following: 05 X 10 = 50 Marks)

1. (a) A firm produces three products. These products are processed in different machines. The time required to produce one unit of each products and the daily capacity of machines are given below 5M

Machine	Time per unit(minutes)			Machine capacity
	Product 1	Product 2	Product3	
M_1	2	3	2	440
M_2	4	-	3	470
M_3	2	5	-	430

The profit for product 1, 2 and 3 is Rs.4, Rs.3 and Rs. 6 respectively. Formulate mathematical model for the problem.

b. Use simplex method to solve the LPP 5M

Maximize $Z = 4x_1 + 10x_2$

Subject to $2x_1 + x_2 \leq 50$, $2x_1 + 5x_2 \leq 100$ and $2x_1 + 3x_2 \leq 90$ and $x_1, x_2 \leq 0$

OR

2. (a) Using graphical method, solve the following L.P.P. 5M

Maximize $Z = 2x_1 + 3x_2$

Subject to $x_1 - x_2 \leq 2$. $x_1 + x_2 \geq 4$, and $x_1, x_2 \geq 0$

(b) Write the applications of operations research 4M

3. (a) Find the optimal solution for the Transportation problem use VAM method 5M

	A	B	C	D	E	Supply
P	4	1	2	6	9	100
Q	6	4	3	5	7	120
R	5	2	6	4	8	120
Demand	40	50	70	90	90	

(b) Solve the following assignment problem. 5M

	P	Q	R	S
A	18	26	17	11
B	13	28	14	26
C	38	19	18	15
D	19	26	24	10

OR

4. (a) Find the initial basic feasible solution for the following transportation problem by VAM 5M

				Supply
11	13	17	14	250
16	18	14	10	300
21	24	13	10	400
Demand 200	225	275	250	

(b) Solve the Assignment problem 5M

	M_1	M_2	M_3	M_4	M_5
J_1	9	22	58	11	19
J_2	43	78	72	50	63
J_3	41	28	91	37	45
J_4	74	42	27	49	39
J_5	36	11	57	22	25

5. (a) Write the optimum sequence algorithm for processing in jobs through 2 machines 4M

(b) We have 4 jobs each of which has to go through the machines M1, M2, M3, M4, M5, M6 in the same order. Processing time in hours is given below. 6M

Job	:	A	B	C	D
Machine M_1	:	18	17	11	20
Machine M_2	:	8	6	5	4
Machine M_3	:	7	9	8	3
Machine M_4	:	2	6	5	4
Machine M_5	:	10	8	7	8
Machine M_6	:	25	19	15	12

OR

6. (a) Write the optimum sequence algorithm for processing 2 jobs through in machines. 4M
   (b) Determine the optimum sequence to minimize total elapsed time from the following 6M

Jobs	:	1	2	3	4	5
Machine A	:	5	1	9	3	10
Machine B	:	2	6	7	8	4

7. (a) Solve the Game without saddle point 5M

	B	
A	2	5
	4	1

   (b) Solve the game graphically.

	Player B			
	2	1	0	-2
Player A	1	0	3	2

OR

8. (a) Define the following: 6M
   (i) Saddle point
   (ii) Pure strategy
   (b) Solve the following game using dominance property 4M

9. (a) Write the rules for construction of a network 3M
   (b) A project consists of the following activities and time estimates. 7M

Activity	:	1-2	2-3	1-4	2-5	2-6	3-6	4-7	5-7	6-7
Least time	:	3	2	6	2	5	3	3	1	2
Greatest time	:	15	14	30	8	17	15	27	7	8
Most likely time:		6	5	12	5	11	6	9	4	5

   (i) Draw the network
   (ii)What is the probability that the project will be completed in 27 days?

OR

10. (a) Construct the network for the project whose activities and their relationships are as given below. 5M

Activity	1-2	1-3	2-4	2-5	3-4	4-5
Duration	8	4	10	2	5	3

   (b) The following table indicates the details of a project. The durations are in days, 'a' refers to optimistic time, 'm' refers to most likely time, 'b' refers to pessimistic time duration. 5M

Activity	1-2	1-3	1-4	2-4	2-5	3-5	4-5
a	2	3	4	8	6	2	2
m	4	4	5	9	8	3	5
b	5	6	6	11	12	4	7

   (1) Draw the network and find the critical path,
   (ii) Determine the expected standard deviation of the completion time.

SECTION-B

(Compulsory question, 01 X 10 = 10 Marks)

11. **Case Study/Problem:** 10M

Use Big-M Method to solve the LPP

Min $Z = 4x_1 + 3x_2$

Subject to $2x_1 + x_2 \geq 10$,

$-3x_1 + 2x_2 \leq 6$

$x_1 + x_2 \geq 6$ and $x_1, x_2 \geq 0$.

MBA II Semester Regular Examinations October/November 2022

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(Common to BDA, BigDA and MBA(GM & BM))

(For students admitted in 2021 only)

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SECTION – A

(Answer the following: 05 X 10 = 50 Marks)

1 (a) What is operations research? State any four applications. What are the various optimization techniques in business operations? 5M

(b) Explain the nature and significance of operations research. 5M

OR

2 (a) Linear programming is one of the most successfully used operations research technique to business decisions. Explain. 5M

(b) Explain the limitations of the LPP method. 5M

Solve the following LPP using the Simplex method.

Maximize $Z = 12x_1 + 16x_2$

Using $10x_1 + 20x_2 \leq 120$

$8x_1 + 8x_2 \leq 80$

$x_1, x_2 \geq 0$

3 (a) Give different practical applications of transportation problem. 5M

(b) What are the types of transportation problems? Explain them with suitable examples. 5M

OR

4 (a) Write a linear programming model of the transportation problem. 5M

(b) Explain the steps to solve using the Hungarian method. 5M

5 (a) Consider the processing time (in mins) of 5 Jobs each of which must go through the two machines M_1 and M_2 in order M_1, M_2 Find a sequence for the job that minimizes total elapsed time and also find idle time for each machine. 5M

	J1	J2	J3	J4	J5
M_1	5	1	9	3	10
M_2	2	6	7	8	9

Show sequence on Gantt chart.

(b) Write a note on the basic assumptions of sequencing problem. 5M

OR

6 (a) Short note on Johnson's algorithm for *n* jobs and 3 machines. 5M

(b) Find the job which should be done first for each machine. Also calculate the total time elapsed needed to complete both the jobs. 5M

Job 1	Sequence	A	B	C	D	E
	Time (Hrs)	3	4	2	6	2
Job 2	Sequence	B	C	A	D	E
	Time (Hrs)	5	4	3	2	6

Contd. in page 2

7 (a) Explain the two-person zero-sum game. 5M

(b) Solve the following game graphically. 5M

	PlayerB	
Player A	1	2
	5	4
	-7	9
	-4	-3
	2	1

OR

8 (a) Throw some light on the significance of game theory for managers in a business organization. Solve the following 2 person zero sum game with the following 3x2 payoff matrix of player A. 5M

	Player B	
Player A	B_1	B_2
A_1	9	2
A_2	8	6
A_3	6	4

(b) "The primary contribution of the game theory has been its concepts rather than its formal application to solving real problem." – Explain. 5M

9 (a) Application of CPM and PERT techniques in project planning and control. 5M

(b) A construction company has listed down various activities that are involved in the construction of a community hall. These are summarized along with immediate predecessor(s) 5M

Table Details of Activities and Immediate Predecessor(s)

Activity	Description	Immediate Predecessor(s)
A	Plan approval	-
B	Site preparation	-
C	Arranging foundation materials	A
D	Excavation for foundation	B
E	Carpentry work for door and window main supporting frames	A
F	Laying foundation	C,D
G	Raising wall from foundation to window base	F
H	Raising wall from window base to lintel level	E, G
I	Roofing	H
J	Electrical wiring and fitting	I
K	Plastering	J,L
L	Making doors and windows and fitting them	A
M	Whitewashing	K
N	Clearing the site before handing over	M

Draw a project network for the above project.

OR

Contd. in page 3

10 (a) Differentiate between CPM and PERT. 5M

(b) Application of CPM and PERT with practical examples. 5M

SECTION – B

(Compulsory question, 01 X 10 = 10 Marks)

11 **Case Study/Problem:** 10M

A manufacturing company makes two types of television sets; one is black and white and the other is colour. The company has resources to make at most 300 sets a week. It takes Rs 1800 to make a black and white set and Rs 2700 to make a coloured set. The company can spend not more than Rs 648000 a week to make television sets. If it makes a profit of Rs 510 per black and white set and Rs 675 per coloured set, how many sets of each type should be produced so that the company has a maximum profit? Formulate this problem as a LPP given that the objective is to maximise the profit.

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