3/16

2504E395

Candidate's Seat No : _____

M.B.A. (GM-OP) Sem.-4 Examination

OM-406

O. R.

April-2025

Time : 2-30 Hours] **[Max. Marks : 70**

Q-1 A)(1) What is operations research? Explain the various operations research Models. 14

(2) Apply the Hurwicz criterion with $\propto = 0.6$ for the following decision problems:

Events / Strategies	A	B	C	D
A1	3	4	4	5
A2	6	2	1	3
A3	1	8	8	4

Q-2 A) (1) Explain two important methods for testing the optimality of initial basic feasible solution. 14

(2) Solve the following transportation problem:

	Destination					
Origin	D_1	D_2	D_3	D_4	D_5	Capacity
O_1	3	2	3	4	1	100
O_2	4	1	2	4	2	125
O_3	1	0	5	3	2	75
Requirement	100	60	40	75	25	

OR

B) (1) Define the transportation problem. Explain two important methods for testing the optimality of initial basic feasible solution.

(2) Solve the following transportation problem to maximize the total profit. Here entries are profits.

	Destination				
Origin	A	B	C	D	Capacity
O_1	40	25	22	33	100
O_2	44	35	30	30	30
O_3	38	38	28	30	70
Requirement	40	20	60	30	

(P.T.O)

Q-3 14

A) For the following problem: Maximize $z = 3x_1 + 2x_2 + 5x_3$

Subject to the constraints:

$$x_1 + 2x_2 + x_3 \leq 430 \quad (1)$$
$$3x_1 + 2x_3 \leq 460 \quad (2)$$
$$x_1 + 4x_2 \leq 420 \quad (3)$$
$$x_1 \geq 0; x_2 \geq 0; x_3 \geq 0$$

OR

B) Formulate and solve the following linear programming problem:

A manufacturer makes straight chairs, and rotating chairs. For each type of chair, he uses three major production areas of cutting, dipping and assembly. Capacities of three areas during the next week are:

Cutting: 200 straight or 300 rotating or any other combination
Dipping: 400 Straight or 400 rotating or any combination
Assembly: 250 straight or 200 rotating or any combination

From a straight chair, he makes a profit of ₹ 5 and from a rotating chair he makes a profit of ₹ 10. Determine the number of straight chairs and number of rotating chairs he must manufacture so as to have maximum profit.

Q-4 **A)** Processing time for jobs A, B, C, D and E and due dates for these jobs in a machine shop are given in table 14

Job	A	B	C	D	E
Processing time (days)	9	7	5	8	6
Due date	16	20	25	20	40

The job may be sequenced as: (i) First Come First Serve, (ii) Shortest Processing Time, (iii) least slack and (iv) earliest due date.

Determine (a) the total completion time of all jobs,
(b) the average job flow time,
(c) the average number of jobs in the machine shop,
(d) the average job lateness,
(e) the average job earliness and
(f) the number of tardy jobs.

OR

B) A machine operator has to perform two operations turning and threading on a number of different jobs. The time required to perform these operations for each job is known. Determine the order in which the jobs should be processed in order to minimize the total time required to complete all the jobs.

Job	Time for turning (hours) (Machine A)	Time for threading(hours) (Machine B)
1	3	8
2	12	10
3	5	9
4	2	6
5	9	3
6	11	1

Q-5 A) 14

(1) A machine shop has a press which is to be replaced as it wears out. A new press is to be installed now and an optimal replacement plan is to be for next 7 years after which the press is no longer required. Following data are available.

Year	1	2	3	4	5	6	7
Cost of new machine (₹)	5,000	5,250	5,500	6,000	6,500	7,250	8,000
Operating Cost (₹)	1,500	2,000	2,500	3,000	3,750	4,500	5,750
Salvage Value(₹)	2,500	1,250	750	500	400	250	0

At what age is replacement due?

(2) Draw the network diagram and mark the critical path and find the total project duration.

Activity	A,B,C	D	E	F	G	H	I	K
Preceding Activity	-	A	B	C	D	E	F	G,H,I
Duration (Hrs)	8,7,2	9	12	9	5	7	4	7