

[Time : 3 Hours]

[Marks:80]

Please check whether you have got the right question paper.

- N.B:
1. Question No.1 is compulsory.
 2. Attempt any four questions from question 2 to 7.
 3. Figure to the right indicates marks.
 4. Use of scientific calculator is allowed.
 5. mixing of sub-questions not allowed

Q.1 a. Find the optimal strategies and value of the game for the following problem 07

		B	
		1	2
A	1	-1	-1
	2	-1	3
	3	-1	2

b. The following are set of activities and different time estimates for a project in days 08

Activity	1-2	2-3	2-4	3-4	3-5	5-6	3-6	4-6
Optimistic (to)	3	6	5	3	1	2	4	2
Most likely (tm)	6	12	11	9	4	5	19	5
Pessimistic (tp)	15	30	17	27	7	8	28	14

- Draw the network. Determine the expected task times and their variances.
- Find the earliest and latest expected times for each node. Find the critical path. What is the probability of completing the project in 40 days $P(z=1.67)=0.9525$.

c. Write dual of the following LPP 05

maximize: $z=8x_1+2x_2+5x_3$
 Subject to: $3x_1+2x_2+5x_3 \leq 40$
 $x_1+7x_2+4x_3 \leq 20$
 $5x_1-2x_3 \geq 12$
 $x_1, x_2 \geq 0, x_3$ is unrestricted in sign

Q.2 A. The purchase price of a machine is 6000 Rs. From the past experience the operating cost of the machine is recorded and is given below. 08

Age	1	2	3	4	5
Operating cost	10,000	12,000	15,000	18,000	20,000

After five years the operating cost = $6,000k$ Where $k=6, 7, 8, 9, 10$ (k is the age in years). If the resale value decreases by 10% of purchase price each year, What is the best replacement policy? Cost of money is zero

b. Solve the following LPP by simplex method 07

Maximize: $Z=3x_1+2x_2$
 Subject to: $x_1-x_2 \leq 1$
 $3x_1-2x_2 \leq 6$
 $x_1, x_2 \geq 0$

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Q.3 a. Four new machines M1, M2, M3, M4 are to be installed in a machine shop. There are five vacant places A, B, C, D, E available. Because of limited space machine M2 cannot be placed at C and M3 cannot be placed at A. Cij, the assignment cost of machine i to place j in Rs. is shown below. Find the optimal assignment schedule 07

	A	B	C	D	E
M1	4	6	10	5	6
M2	7	4	-	5	4
M3	-	6	9	6	2
M4	9	3	7	2	3

b. Solve the following LPP by Big-M method 08

maximize $Z=3x_1-x_2$

Subject to: $2x_1+x_2 \leq 2,$

$x_1+3x_2 \geq 3,$

$x_2 \leq 4,$

and $x_1, x_2 \geq 0$

Q.4 a. Four jobs are to be processed on each of the five machines A,B,C,D,E in the order ABCDE. Find the total minimum elapsed time T and idle time of the machines C,D and E 08

Job---->	1	2	3	4
A	7	6	5	8
B	5	6	4	3
C	2	4	5	3
D	3	5	6	2
E	9	10	8	6

b. A salesman has to visit five cities A,B,C,D,E. The distance between 5 cities are as below. If the salesman starts from city A and has to come back to city A which route will he select so that the total time to visit all cities will be minimum? 07

		TO-CITY				
		A	B	C	D	E
Form city	A	0	7	6	8	4
	B	7	0	8	5	6
	C	6	8	0	9	7
	D	8	5	9	0	8
	E	4	6	7	8	0

Q.5 A. Use two phase method to solve the following LPP 08

Minimize $Z=x_1+x_2$

Subject to: $2x_1+x_2 \geq 4,$

$x_1+7x_2 \geq 7,$

and $x_1, x_2 \geq 0$

b. A cement factory manager is considering the best way to transport cement from his three manufacturing contains P,Q,R to depots A, B,C, D,E. The weekly production and demand along with transportation costs per ton are given below. The availability at the centers P, Q, R are 60,35,40 and the demand at the depots are 22,45,20,18,30 respectively. What should be the optimum distribution schedule? 07

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	A	B	C	D	E
P	4	1	3	4	4
Q	2	3	2	2	3
R	3	5	2	4	4

- Q.6 a. Consider the data shown below for a project
- Draw the network diagram and determine the project duration and the critical path
 - Determine total float, Free float and independent float for each activity

08

Activity	1-2	1-3	1-4	2-5	3-5	4-6	5-6
Duration(Weeks)	2	4	3	1	6	5	7

- b. Solve the following LPP by Dual simplex method

Minimize $Z=10x_1+6x_2+2x_3$

Subject to: $x_1-x_2+x_3 \geq 1$,

$3x_2-x_2-x_3 \geq 2$,

and $x_1, x_2, x_3 \geq 0$

07

- Q.7 a. A food product company is contemplating the introduction of a revolutionary new product with new packaging to replace the existing product at much price (S1) or a moderate change in the composition of the existing product with a new package at a small increase in price (S2) or a small change in the composition of the existing product with a negligible increase in price (S3). The three possible states of nature of events are: i) High increase in sales (N1), ii) no change in sales (N2), and iii) decrease in sales (N3). The marketing department of the company worked out the payoffs in terms of yearly net profits for the each course of action for these events. This is shown below

08

States of nature	Courses of action		
	S1	S2	S3
N1	7,00,000	5,00,000	3,00,000
N2	3,00,000	4,50,000	3,00,000
N3	1,50,000	0	3,00,000

Which strategy the company should choose on the basis of i) Maximin criterion, ii) Maximax criterion, iii) Minimax regret criterion iv) Laplace criterion

- b) A firm makes two types of furniture, Chair and tables. The contribution for each product as calculated by the accounting department is Rs 20/ per chair and Rs 35/ per table. Both products are processed on three machines M1, M2 and M3. The time required in hours by each product and total time available in hour per week on each machine are as follows.

07

Machine	Chair	Table	Available Time
M1	3	3	36
M2	5	2	50
M3	2	6	60

How should the manufacturing schedule his production in order to maximize contribution? Formulate as LPP and solve graphically.