

Duration: 3 Hours

Total Marks: 80

- N.B:** (1) Question No.1 is compulsory.
 (2) Attempt any three questions out of the remaining five.
 (3) Assume suitable data if necessary but justify the same.
 (4) Figures to the right indicate full marks.

Q1. Attempt any four. **(20)**

A. Solve the following L.P. problem using graphical method.

Maximise $Z = 2x_1 + 3x_2$
 Subject to, $x_1 + x_2 \leq 30$
 $x_2 \geq 3$
 $x_2 \leq 12$
 $x_1 - x_2 \geq 0$
 $0 \leq x_1 \leq 20$

B. Find the initial basic feasible solution to the transportation problem using row minima method.

		<i>To</i>				<i>Available</i>
		5	2	4	3	22
		4	8	1	6	15
<i>From</i>	4	6	7	5		8
<i>Requirement</i>	7	12	17	9		

C. Solve the following assignment problem. The matrix entries are processing time in hours.

		<i>Operators</i>				
		A	B	C	D	E
1	11	17	8	16	20	
2	9	7	12	6	15	
3	13	16	15	12	16	
4	21	24	17	28	26	
5	14	10	12	11	13	

D. A bank has only one typist. Since the typing work varies in length the typing rate is randomly distributed approximating a Poisson distribution with mean service rate of 8 letters per hour. The letters arrive at a rate of 6 per hour during the entire 8 hour work day. If the type writer is valued at Rs. 30 per hour, determine:

1. Equipment utilization.
2. Average cost due to waiting on the part of typewriter.
3. Write a note on resource leveling.

E. Write a note on resource leveling.

Q 2. A. A project duration has following characteristics:

Activity	1-2	1-3	2-4	2-6	3-4	3-5	4-5	5-6
t_o (weeks)	1	5	3	1	8	2	5	2
t_m (weeks)	4	10	3	4	15	4	5	5
t_p (weeks)	7	17	3	7	26	8	5	8

Construct a PERT network. Find critical path and variance for each event. Find the project duration at 95% probability. **(10)**

B. A gambler at a horse race is considering placing a bet on a specific horse. There are four possible alternatives and four states of nature with the following pay-offs: **(10)**

Strategies	States of nature			
	<i>A wins</i>	<i>B wins</i>	<i>C wins</i>	<i>All lose</i>
Bet A	7	-2	-2	-2
Bet B	3	3	-2	-2
Bet C	2	2	2	-2
Do not bet	0	0	0	0

- (a) What is the maximin strategy?
- (b) What is the minimax strategy?
- (c) What strategy should be selected as per Hurwicz criterion with $\alpha = 0.5$?
- (d) What strategy should be selected as per Laplace criterion?

Q4. A. Solve the following L.P. problem using Big-M method. **(10)**

Maximise $z = -2x_1 - x_2$
 subject to, $3x_1 + x_2 = 3$
 $4x_1 + 3x_2 \geq 6$
 $x_1 + 2x_2 \leq 4$
 where $x_1, x_2 \geq 0$

B. A complex airborne navigating system incorporates a subassembly which unrolls a map of the flight plan synchronously with the movement of the aeroplane. This assembly is bought on very good terms from a subcontractor, but is not always in perfect adjustment on delivery. The subassemblies can be readjusted on delivery to guarantee accuracy at a cost of Rs. 50 per subassembly. It is not, however, possible to distinguish visually those subassemblies that need adjustment.

Alternatively, the subassemblies can each be tested electronically at a cost of Rs. 10 per subassembly tested. Past experience shows that about 30% of those supplied are defective; the probability of the test indicating a bad adjustment when the subassembly is faulty is 0.8, while the probability that the test indicates a good adjustment when the subassembly is properly adjusted is 0.7. If the adjustment is not made and the subassembly is found to be faulty when the system has its final check, the cost of subsequent rectification will be Rs. 140.

Draw up an appropriate decision tree to show the alternatives open to the purchaser and use it to determine his course of action. **(10)**

Q3. A. Find the optimum solution the following transportation problem in which cell entries represent unit costs. **(10)**

		<i>To</i>			
		2	7	4	<i>Available</i>
		3	3	1	5
<i>From</i>	5	4	4	7	8
	1	6	6	2	7
<i>Required</i>	7	9	9	18	14

B. For a given network data, draw the network, determine the total float, independent and interfering floats and identify the critical path. **(10)**

Activity	0-1	1-2	1-3	2-4	2-5	3-4	3-6	4-7	5-7	6-7
Duration	2	8	10	6	3	3	7	5	2	8

Q5. A. Solve the following (2 x 3) game graphically. **(8)**

		<i>Player B</i>		
		I	II	III
<i>Playe</i>	I	1	3	11
	II	8	5	2

B. Solve the following game using dominance principle. Solve it optimally. **(6)**

		<i>Player B</i>					
		1	2	3	4	5	6
<i>Player A</i>	1	4	2	0	2	1	1
	2	4	3	1	3	2	2
	3	4	3	7	-5	1	2
	4	4	3	4	-1	2	2
	5	4	3	3	-2	2	2

C. Explain the various costs associated with an inventory? **(6)**

6. A. Solve the following L.P. problem using Simplex method. **(8)**

Maximise $Z = 2x_1 + x_2$
 Subject to, $x_1 + 2x_2 \leq 10$
 $x_1 + x_2 \leq 6$
 $x_1 - x_2 \leq 2$
 $x_1 - 2x_2 \leq 1$
 Where $x_1, x_2 \geq 0$

B. A sandwich maker has the following probabilities of selling the sandwiches in a day. Cost of making a sandwich is Rs. 12 and sales price is Rs. 20. He cannot sell the unsold sandwiches on next day as they get perished. How many sandwiches he should make? **(6)**

No. of sandwiches sold	Probabilities
80	0.12
82	0.16
84	0.22
86	0.28
88	0.32

C. What is simulation? List its various advantages & applications of the simulation. **(6)**