(17)

QP Code : **6109**

Time 3 Hours   **Total marks 80**

Instructions – 1. Question no. ONE is compulsory.
2. Attempt any THREE out of remaining FIVE questions.
3. Assume suitable data where ever necessary but justify the same.
4. Use of calculators, random number tables, normal distribution tables is permitted.
5. Use graph papers where ever necessary.

1. Attempt any Four of the followings: (20)
   a) Explain the terms – Optimal order quantity, and Lead time.
   b) What is Monte Carlo simulation? What types of problems can be solved by it?
   c) Explain the following terms with suitable examples – infeasible solution and unbounded solution in the context of Linear programming problem.
   d) Write dual of following LPP.
      Minimize $Z = 20x + 10y$
         Subject to $x + 2y \leq 40$
                  $3x + y \geq 30$
                  $4x + 3y = 60$
                  $x, y \geq 0$.
   e) Solve the following games

		B		
	4	1	2	5
A	7	8	5	9
	2	0	4	3

2. a) The owner of bakery product shop has observed the following demand pattern for a particular brand of cakes.

Daily demand	0	10	20	30	40	50
Probability	0.02	0.08	0.15	0.40	0.30	0.05

Every morning he receives fresh cakes and places order for next day. The order quantity for next day is equal to the number of cakes the demanded on previous day. Assuming that he receives 30 cakes on first day and places order for 30 cakes for next day, simulate the system to determine –
   a) Average number of cakes sold per day.
   b) Probability of stock out on any day.
   c) Average number of unsold cakes per day if he does not sell stale cakes.
   d) Average profit per day if he earns profit of Rs.20 per cake and returns unsold cakes next morning with loss of Rs. 10.   (10)
   Random no. 3244 8857 9516 8058 6047 9504 4554 3172 8699 3584

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b) At a booking window customers arrive at the rate of 10 per minute approximated to Poisson's distribution. If service time is exponentially distributed with a mean of 15 per minute, determine a) Probability that the booking clerk waits for the customer. b) Probability that there are at least 3 customers in the queue. c) Average number of customers in system d) Average time spent in the queue e) Probability that the customer is served within four minutes.   (10)

3. a) Solve the following problem using Two Phase method –   (10)

   Maximize $Z = 15x + 20y$
   Subject to $3x + y \geq 120$
                        $3x + 11y \geq 330$
                        $x + y \leq 80$
                        $x, y \geq 0.$

b) Five salesmen are to be assigned to five territories. Based on the past performance, the following table shows the annual sales (in lakhs) that can be generated by each salesman in each territory. Find the optimum assignment. ** indicates that Salesman 4 does not wish to work in territory 2.   (10)

	T1	T2	T3	T4	T5
S1	27	15	11	14	10
S2	32	28	31	15	18
S3	16	19	16	26	30
S4	18	**	22	32	25
S5	21	20	26	16	12

4. a) The following table gives probability distribution of failures observed for a certain type of light bulbs: (10)

Week	1	2	3	4	5
% failed by the end of week	5	10	25	35	25

There are 10,000 bulbs in use and it costs Rs.20 to replace an individual bulb which has burnt out at the end of the week. If all bulbs are replaced simultaneously it would cost Rs.14 per bulb. It is proposed to replace all bulbs at fixed interval of time, irrespective of their status and to continue replacing burnt out bulbs at the end of every week. At what interval should all the bulbs be replaced? What is the average cost of replacement if all the bulbs are replaced as per individual replacement policy? What is the optimal replacement policy?

b) A TV manufacturing company has three production units and 4 main distribution centers. Cost of transporting one unit from each production unit to distribution centre is given in the matrix. The production capabilities of production units A, B, and C are 60, 75, and 105 respectively and the requirements of distribution centres are 50, 65, 75, and 100 respectively. Determine the optimal distribution policy. Use VAM to find initial solution and MODI for finding optimal solution.   10

Plants	Distribution Centre			
	W	X	Y	Z
A	17	20	14	12
B	15	21	25	14
C	15	14	15	16

5. a) Comfort Travel Agency arranges 1-week tours to Goa and south Konkan region. The agency has to provide 7, 4, 7 and 8 rental cars over the next 4 weeks. The agency subcontracts with a local car dealer to supply rental needs. The dealer charges a rental fee of Rs.220 per car per week, plus a flat fee of Rs.500 for any rental transaction. The agency, however, may elect to keep the rentals for an additional week and simply continue to pay the rent. What is the best way for the agency to handle the rental situation?   (10)

b) Solve the following games –   (10)

i)

		B	
	9	-3	2
A	- 6	7	- 1
	- 3	3	- 4

ii)

A	B				
	1	3	2	7	4
	3	4	1	5	6
	6	5	7	6	5
	2	0	6	3	1

6. a) A tailor working on contract has to make 2 clothing items A & B. He can make five of each item in an hour and wishes to produce at least 25 items in a day. He can get at the most 16 m² of material needed to produce the items. It takes 1 hour to process 2 m² of A & 1 hour to process 4m² of B. He gets 1 unit of profit after spending 1 hour on item A & five units of profit after spending 1 hour on item B. He can't spend more than five hours on item A. How many hours should he spend making each item to maximize profit?   (12)

b) A bush manufacturing company has a contract to supply 5000 bushes to an automobile factory per day. The company has capacity to manufacture 8000 bushes per day and holding cost of 1000 bushes is 8 paisa per day. Set up cost is Rs.20. No shortages are allowed. What would be his frequency of production run? Sketch the inventory.   (08)

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