M.Sc. DEGREE EXAMINATION,APRIL 2020
II Year III Semester
Operations Research

Time : 3 Hours **Max.marks :75**

Section A $(10 \times 2 = 20)$ Marks

Answer any **TEN** questions

1. Define the term 'stage' in dynamic programming.
2. What is return function in Dynamic programming.
3. State any one application of dynamic programming.
4. Write the four types of decision making environment.
5. Define pay–off in decision theory.
6. List out the components of decision tree.
7. What is inventory?
8. List out the four components of total inventory cost.
9. Define steady state condition.
10. Define utilization factor.
11. What is a necessary condition for x_0 to be the local extrema of y=f(x) in the interval a$\leq x \leq b$?
12. Write the general form of Non-linear programming problem.

Section B $(5 \times 5 = 25)$ Marks

Answer any **FIVE** questions

13. Summarize the procedure of solving a problem by the dynamic programming approach.
14. Write down the various steps involved in the calculation of EMV.
15. The demand pattern of the cakes made in a bakery is as follows:

No. of cakes demanded:	0	1	2	3	4	5
Probability:	0.05	0.10	0.25	0.30	0.20	0.10

If the preparation cost is Rs 3 per unit and selling price is Rs. 4 per unit, how many cakes should the baker bake for maximizing his profit.

16. A contractor has to supply 10,000 bearings per day to an automobile manufacturer. He finds that when he starts production run, he can produce 25,000 bearings per day. The cost of holding a bearing in stock for a year is Rs. 2 and the setup cost of a production run is Rs. 1800. How frequently should production run be made? (Assume that the automobile company is working 300 days in a year).

17. Arrivals at telephone booth are considered to be Poisson with an average time of 10 minutes between one arrival and the next. The length of phone call is exponential with mean 3 minutes. (a) What is the probability that a person arriving at the booth will have to wait? (b) What is the average length of the queue that forms from time to time?

18. A trader receives x units of an item at the beginning of each month. The cost of carrying x units per month is given by :

    C(x)= $\dfrac{c_1x_1^2}{2n} + \dfrac{c_2(20n-x)^2}{2n}$.

    Where c_1 = carrying cost/item = Rs. 10,

    C_2= shortage cost/item = Rs.150, n -number of items supplied per day = 30.

    Determine the order quantity x , that would minimize the cost of inventory.

19. Consider the function f(x) $= x_1 + 2x_2 + x_1x_2 - x_1^2 - x_2^2$.Determine the maximum or minimum point (if any) of the function.

Section C $(3 \times 10 = 30)$ Marks

Answer any **THREE** questions

20. Use dynamic programming approach, to solve the following LPP:

    Maximize Z = $3x_1 + 5x_2$

    subject to the constraints

    $x_1 \leq 4$, $x_2 \leq 6$, $3x_1 + 2x_2 \leq 18$ and $x_1, x_2 \geq 0$.

21. A retailer purchases cherries every morning at Rs.50 a case and sells them for Rs.80 a case. Any case remaining unsold at the end of the day can be disposed of next day at a salvage value of Rs.20 per case (thereafter they have no value). Past sales have ranged from 15 to 18 cases per day. The following is the record of sales for the past 120 days :

Cases sold :	15	16	17	18
No of days :	12	24	48	36

Find how many cases the retailer should purchase per day to maximize his profit.

22. The production department of a company requires 3600 kg of raw material for manufacturing a particular item per year. It has been estimated that the cost of placing an order is Rs. 36 and the cost of carrying inventory is 25% of the investment in the inventories. The price is Rs. 10 per kg. Help the purchase manager to determine an ordering policy for raw material.

23. A television repairman finds that the time spent on his jobs has an exponential distribution with a mean of 30 minutes. If he repairs the sets in the order in which they came in, and if the arrival of sets follows a Poisson distribution with an approximate average rate of 10 per 8 - hour day, what is the repairman's expected idle time each day? How many jobs are ahead of the average set just bought in?

24. Use Wolfe's method to solve the quadratic programming problem:

    Maximize $Z = 4x_1 + 6x_2 - 2x_1^2 - 2x_1x_2 - 2x_2^2$

    subject to the constraints
    $x_1 + 2x_2 \leq 2$;
    $x_1, x_2 \geq 0$.