M.Sc. DEGREE EXAMINATION,NOVEMBER 2019
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 terms stage and state in dynamic programming.
2. What is dynamic programming problem.
3. State Hurwicz criterion.
4. Define optimistic criterion.
5. What are the components of inventory cost?
6. Define the term " economic order quantity".
7. Define transient state of a queuing system.
8. What is meant by queue length?
9. What is a non-linear programming problem?
10. State the general structure of Quadratic programming problem.
11. Explain the terms in queues: Balking and Jockeying.
12. Define order cycle.

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

Answer any **FIVE** questions

13. Divide quantity b into n parts so as to maximize their product. Let $f_n(b)$ be the maximum value. Then show that $f_1(b) = b, \quad f_n(b) = \max_{0 \le z \le b} \{z \ f_{n-1}(b-z)\}$.

14. Discuss the difference between decision making under certainty and uncertainty.

15. A product is sold at the rate of 50 pieces per day and is manufactured at a rate of 250 pieces per day. The set-up cost of the machines is Rs 1,000 and the storage cost is found to be Rs 0.0015 per piece per day. With labour charge of Rs. 3.20 per piece, material cost at Rs. 2.10 per piece and overhead cost of Rs. 4.10 per piece, find the minimum cost batch size if the interest charges are 8 per cent(assume 300 working days in a year).

16. What do you understand by (i) arrival process and (ii) service process?

17. The efficiency E of a small manufacturing concern depends on the workers W and is given by $10E=-\left(W^3/40\right)+30W-392$. Find the strength of the workers which give maximum efficiency.

18. State and prove Kuhn-Tucker sufficient conditions in non-linear programming.

19. 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 set-up of a production run is Rs 1800. How frequently should production run be made?(assume 300 working days in the year).

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

Answer any **THREE** questions

20. Use dynamic programming to solve the following problem:

    Minimize $Z = y_1^2 + y_2^2 + y_3^2$

    Subject to the constraint

    $y_1 + y_2 + y_3 = 10$

    $y_1,\ y_2,\ y_3 \geq 0$

21. A businessman has two independent investment portfolios A and B available to him, but he lacks the capital to undertake both of them simultaneously. He can choose A first and then stop, or if A is not successful, then take, B or vice versa. The probability of success of A is 0.6, while for B it is 0.4. Both investment schemes require an initial capital outlay of Rs 10,000 and both return nothing if the venture is unsuccessful. Successful completion of A will return Rs 20,000 (over cost) and successful completion of B will return Rs 24,000 (over cost). Draw decision tree and determine the best strategy.

22. Derive the EOQ formula with constant demand and variable order cycle time

23. If the arrivals are completely random, then prove that the probability distribution of number of arrivals in a fixed time interval follows a poisson distribution

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 constraint

    $x_1 + 2x_2 \leq 2$ and $x_1,\ x_2 \geq 0$

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