M.Sc DEGREE EXAMINATION,APRIL 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 return function
2. Write the two different ways in dynamic programming.
3. Define Wald's criterion.
4. Define decision making under risk.
5. Define purchase cost.
6. Define ordering cost.
7. Define queue discipline.
8. Define transient state and steady state.
9. Define local extreme value.
10. Write the sufficient condition for local minimum and maximum value.
11. Write the types decision making under uncertainty.
12. Define dynamic programming problem.

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

Answer any **FIVE** questions

13. Determine the value of u_1 , u_2 and u_3 so as to

    Maximize $Z = u_1.u_2.u_3$

    Subject to the constraints $u_1 + u_2 + u_3 = 10$ and $u_1, u_2, u_3 \geq 0$.

14. The manager of a flower shop promises its customers delivery within four hours on all flowers orders. All flowers are purchased on the previous day and delivered to parker by 8.00 am the next morning. The daily demand for roses is as follows

Dozens of roses :	70	80	90	100
Probability :	0.1	0.2	0.4	0.3

    The manager purchases roses for Rs 10 per dozen and sells them for Rs 30. All unsold roses are donated to a local hospital. How many dozens of roses should parker order each evening to maximize its profits? What is the optimum expected profit?

15. 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 cost of a production run is Rs 180. How frequently should production run be made?

16. In a railway marshalling yard, goods trains arrive at a rate of 30 trains per days. Assuming that the interarrival time follows an exponential distribution and the service time (the time taken to hump a train) distribution with an average of 36 minutes. Calculate

    (a) expected queue size (line length)

    (b) probability that the the queue size exceeds 10.

17. Obtain the necessary conditions for the optimum solution of the following problem:

    Minimize $f(x_1, x_2) = 3e^{2x_1+1} + 2e^{x_2+5}$

    Subject to the constraint $g(x_1, x_2) = x_1 + x_2 - 7 = 0$ and $x_1, x_2 \geq 0$.

18. A company that operates for 50 weeks in a year is concerned about its stocks of copper cable. This costs Rs 240 a meter and there is a demand for 8,000 meters a week. Each replenishment costs Rs 1,050 for administration and Rs 1,650 for delivery, while holding costs are estimated at 25 per cent of value held a year. Assuming no shortage are allowed , what is the optimal inventory policy for the company? How would this analysis differ if the company wanted to maximize its profits rather than minimize cost? What is the gross profit if the company sells the cable for Rs 360 a meter?

19. Discuss the Dynamic programming approach for solving linear programming problem.

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

Answer any **THREE** questions

20. A company has decided to introduce a product in three phases. Phase 1 will features making a special offer at a greatly reduced rate of attract the first time buyers. Phase 2 will involve intensive advertising to persuade the buyers to continue purchasing at a regular price. Phase 3 will involve a follow up advertising and promotional campaign.

    A total of Rs 5 million has been budgeted for this marketing campaign. If m is the market share captured in phase 1 fraction f2 of m is retained in phase 2, and fraction f3 of market share in phase 2 is retained in phase 3. The expected values of m, f2 and f3 at different levels of money expended are given below.

How should the money be allocated to the three phases in order to maximize the final shares?

Money spent share (Rs millions)	Effect of Market		
	m per cent	f_2	f_3
0	0	0.30	0.50
1	10	0.50	0.70
2	15	0.70	0.85
3	22	0.80	0.90
4	27	0.85	0.93
5	30	0.90	0.95

21. A certain piece of equipment has to be purchased for a construction project at a remote location. This equipment contains an expensive part that is subject to random failure. Spares of this part can be purchased at the same time the equipment is purchased. Their unit cost is Rs 1,500 and they have no scrap value. If the parts fails on the job and no spare is available, the part will have to be manufactured on a special order basis. If this required, the total cost including down time of the equipment , is estimated at Rs 9,000 for each occurrence. Based on previous experience with similar parts, the following property estimates of the number of failures expected over the duration of the project are provided below:

Failure :	0	1	2
Probability :	0.80	0.15	0.05

(a) Determine optimal EMV* and optimal number of spares to purchase initially.

(b) Based on opportunity losses, determine the optimal course of action and optimal value of EOL.

(c) Determine the expected profit with perfect information and expected value of prefect information.

22. Explain the Economic production Quantity model when supply is Gradual.

23. Explain Single server Queuing model's (M/M/1) : (∞/FCFS)

24. Find the optimum solution of the following constrained multivariable problem

Minimize $Z = x_1^2 = (x_2 + 1)^2 + (x_3 - 1)^2$

Subject to the constraint $x_1 + 5x_2 - 3x_3 = 6$ and $x_1, x_2, x_3 \geq 0$.