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Reg. No.....

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# M.Sc. DEGREE (C.S.S.) EXAMINATION, MAY 2017

**Fourth Semester**

Faculty of Science

Branch I(A)—Mathematics

MT 04E 07—OPERATIONS RESEARCH

(2012 Admissions—Regular)

Time : Three Hours

Maximum Weight : 30

## Part A

*Answer any* **five** *questions.*

*Each question has weight* 1.

1. Explain with suitable examples the various costs that are involved in inventory problems.
2. What is the purpose of safety stock in inventory decisions.
3. Define a queue. Give a brief description of the types of queue discipline commonly found.
4. What does the following mean :
   (a) Arrival and service pattern.
   (b) Traffic intensity.
5. State the basic features of dynamic programming.
6. What are the applications of dynamic programming.
7. What are the elements of simulation model.
8. Discuss the use of uniform distribution in simulation techniques.

(5 × 1 = 5)

## Part B

*Answer any* **five** *questions.*

*Each question has weight* 2.

9. The production department of a company requires 3600 kg of a 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 percent of the investment in the inventories. The price is Rs. 10 per kg. Find (1) the optimum lot size and ; (2) the minimum cost.

**Turn over**

10. Describe the basic characteristics of an inventory system. Derive an expression for the EOQ for a production inventory situation with known demand.

11. If the number of arrivals in a queuing process is Poisson, show that inter-arrival time follows exponential distribution.

12. Derive the Pollaczek-Khintchine equation for (M | G | 1) queuing process.

13. State Bellmann's principle of optimality. Explain how this principle is used to solve a multi-stage decision problem.

14. Using dynamic programming principles, solve :

    Max $Z = y_1 y_2 y_3$

    Subject to the constraint $y_1 + y_2 + y_3 = 5$,

    $y_1, y_2, y_3 \geq 0$.

15. Explain probability integral transform.

16. Distinguish between solutions derived from simulation models and solutions derived from analytical models.

$(5 \times 2 = 10)$

## Part C

*Answer any* **three** *questions.*
*Each question has weight 5.*

17. (a) What are the costs associated with an inventory. Define reorder point and explain how it is related to lead time demand.

    (b) A certain item costs Rs. 235 per ton. The monthly requirement is 5 tons and each time stock is replenished there is a set-up cost of Rs. 1,000. The cost of carrying inventory has been estimated at 10 percentage of the value of the stock per year. What is the optimal order quantity.

18. Define (M | G | 1) queuing system and state when such a system is considered. Find out expected queue length for such systems.

19. (a) Explain a dynamic programming problem. Describe recursive equation approach to solve dynamic programming problems.

    (b) Use dynamic programming to show that $\sum p_i \log p_i$ subject to the constraints $\sum p_i = 1$ and $p_i \geq 0$ is minimum when $p_i = \frac{1}{n}$ for $i = 1, 2, \ldots\ldots, n$.

20. Define the problem of sequencing. What are the basic assumptions in sequencing problem. Describe the method of processing $n$ jobs through 2 machines.

21. (a) Explain the use of Monte-Carlo simulation in queuing theory.

    (b) Describe random number generation procedure using Poisson distribution.

22. Explain birth-death process.

$(3 \times 5 = 15)$