Roll No. ..... Total Pages : 5

# 4245/MJ

**G-10/2051**

**OPTIMIZATION TECHNIQUES - II**

Paper–SC-404

Semester–IV

Time allowed : 3 Hours] [Maximum Marks : 70

**Note :** The candidates are required to attempt two questions each from section A and section B carrying 10 marks each and the entire Section C consisting of 10 short answer type questions carrying 3 marks each.

## SECTION-A

1. If the number of arrivals in some time interval follows a Poisson distribution, show that the distribution of the time interval between two consecutive arrivals is exponential. 10



2. Establish the probability distribution formula for Pure-Death Process. 10

3. Derive the probability density function of waiting time distribution for the M/M/I model. 10

4. A supermarket has two girls ringing up sales at the counters. It the service time for each customer is exponential with mean 4 minutes and if people arrive in a Poisson fashion at the counter at the rate of 10 per hour.

   (i) Calculate the probability that an arrival will have to wait for service.

   (ii) Find the expected percentage of idle time for each girl.

   (iii) If a customer has to wait, find the expected length of his waiting time. 10

## SECTION-B

5. Use dynamic programming to solve the following problem :

Maximize $Z = y_1 . y_2 ..... y_n$

subject to the constraints

$y_1 + y_2 + .... + y_n = c$ and $y_i \quad 0 ; j = 1, 2 ...., n.$

6. A ship is to be loaded with stock of 3 items. Each unit of item *n* has a weight *Wn* and value *Vn*. The maximum cargo weight the ship can take is 5 and the details of the three items are as follows :

| Item(n) | Weight(Wn) | Value(Vn) |
|---|---|---|
| 1 | 2 | 7 |
| 2 | 3 | 10 |
| 3 | 1 | 3 |

Find the most valuable cargo load without exceeding the maximum cargo weight by using dynamic programming. 10

7. Use dynamic programming to solve the LPP: 10

Maximize $Z = x_1 + 9x_2$

Subject to the constraints



$2x_1 + x_2 \quad 25$

$x_2 \quad 11$

$x_1, x_2 \quad 0.$

8. State Bellmen's principle of optimality and explain by an illustrative example how it can be used to solve multi-stage problem with finite number of stages. 10

## SECTION-C

9. (i) Write a step by step procedure to solve a general problem by dynamic programming.

(ii) Write short note on characteristics of dynamic programming.

(iii) What are the applications of dynamic programming?

(iv) Describe recursive equation to solve dynamic programming problem.

(v) Explain the advantage and disadvantage of dynamic programming.

(vi) What are the limitations of Queueing theory?

(vii) Briefly explain the important characteristics of queuing system.

(viii) What do you understand by non Poisson queueing model.

(ix) Explain $M/E_k/1 : /FCFS$ Queueing model.

(x) State and explain the condition for the existence of steady state in case of M/M/C queueing system.

$3 \times 10 = 30$