2017

M.Sc.

3rd Semester Examination

APPLIED MATHEMATICS WITH OCEANOLOGY AND COMPUTER PROGRAMMING

PAPER—MTM-306(OR)

Full Marks : 50

Time : 2 Hours

The figures in the right-hand margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

(Operational Research Modelling-I)

Answer *Q. No. 1* and any *four* questions from the rest.

1. Answer any *four* questions : 4×2

(a) State Bellman's principle of optimality.

(b) What are the critical paths and critical activities in network analysis ?

(c) What is simulation ? Describe its advantages in solving the problems.

(d) What is 'optimal replacement age' of an item ?

(e) Define "Individual replacement" and "Group replacement" policies.

(f) Explain holding cost involved in inventory management.

2. A man is engaged in buying and selling identical items. He operates from a warehouse that can hold 500 items. Each month he can sell any quantity that he chooses upto the stock at the beginning of the month. Each month, he can buy as much as he wishes for delivery at the end of the month so long as his stock does not exceed 500 items. For the next four months, he has the following error-free forecasts of cost sales prices :

Month	i	4	3	2	1
Cost	C_i	27	24	26	28
Sale Price	p_i	28	25	25	27

If he currently has a stock of 200 units, what quantities should he sell and buy in next four months ? Find the solution using dynamic programming. 8

3. A small project consist of seven activities, the details of which are given below :

Activity	Time estimates			Predecessor
	t_0	t_m	t_p	
A	3	6	9	None
B	2	5	8	None
C	2	4	6	A
D	2	3	10	B
E	1	3	11	B
F	4	6	8	C,D
G	1	5	15	E

Find the critical path. What is the probability that the project will be completed by 18 weeks ? 8

4. (a) Explain a method for generation of random number. 4

(b) Explain Monte-Carlo simulation. State different mathematical steps in Monte-Carlo method. 4

5. Derive the optional ordering policy for a single period discrete probabilistic inventory model with uniform demand and no set-up cost.

6. Derive the probability density function of waiting time excluding service time of the $(M/M/1 : \infty/FCFS/\infty)$

queueing system. Hence find average waiting time in queue and average waiting time in system. 5+3

7. Three different items are kept in a store. The demand rates are constant for the three items. Production rate is instantaneous and no shortage are permitted. The data for the problems are given below.

Item	*Set-up cost (Rs)*	*Demand rate per year*	*Holding cost (Rs)*	*Unit cost (Rs)*
1	50	10,000	20	6
2	40	12,000	20	7
3	60	7,500	20	5

Determine the economic order quantities when the total value of average inventory levels of these items is Rs. 1,000.00. 8

[Internal Assessment—10 Marks]