

Roll No.

Total Pages : 4

BT-6/M-20

36127

OPERATION RESEARCH

Paper–ME-306 N

Opt. (I)

Time : Three Hours]

[Maximum Marks : 75

Note : Attempt only 5 questions, selecting at least *one* question from each unit. Unless stated otherwise, the Symbols have their usual meaning in context with the subject. Assume suitably and state, additional data required, if any.

UNIT-I

1. Explain with the help of examples, the necessity and scope of Operations Research in industry. 15
2. Solve the following L.P.P. :
Minimize $Z = 4a + 2b$
subject to : $3a + 1b \geq 27$
 $-1a - 1b \leq -21$
 $1a + 2b \geq 30$ and both a and b are ≥ 0 . 15

UNIT-II

3. Four factories, A, B, C and D produce sugar and the capacity of each factory is given as : Factory A produces 10 tons of sugar and B produces 8 tons of sugar, C produces 5 tons of sugar and that of D is 6 tons of sugar. The sugar has demand in three markets X, Y and Z The demand of market X is 7 tons, that of market Y is 12 tons and the demand of market

Z is 4 tons. The following matrix gives the returns the factory can get, by selling the sugar in each market. Formulate a transportation problem and solve for maximizing the returns.

	Profit in Rs. per ton ($\times 100$) Markets			Availability in tons
	X	Y	Z	
Factories				
A	4	3	2	10
B	5	6	1	8
C	6	4	3	5
D	3	5	4	6
Requirement (tons)	7	12	4	$\Sigma b = 29$ $\Sigma d = 23$

15

4. A small project is composed of 7 activities whose time estimates are listed below. Activities are being identified by their beginning (*i*) and ending (*f*) node numbers.

Activities		Time in weeks		
<i>i</i>	<i>j</i>	t_0	t_l	t_p
1	2	1	1	7
1	3	1	4	7
1	4	2	2	8
2	5	1	1	1
3	5	2	5	14
4	6	2	5	8
5	6	3	6	15

1. Draw the network.
2. Calculate the expected variances for each.
3. Find the expected project completed time. 15

UNIT-III

5. With the help of a single server queuing model having inter-arrival and service times constantly 1.4 minutes and 3 minutes, respectively. Explain discrete simulation technique taking 10 minutes as the simulation period. Find from this average waiting time and percentage of idle time of the facility of a customer. Assume that initially the system is empty and the first customer arrives at time $t = 0$. 15
6. (a) Write a note on basic structure of queuing models citing some commonly known queuing situations. 10
(b) Explain with an example, the steps in decision theory. 5

UNIT-IV

7. In a departmental store one cashier is there to serve the customers. The customers pick up their needs by themselves. The arrival rate is 9 customers for every 5 minutes and the cashier can serve 10 customers in 5 minutes. Assuming Poisson arrival rate and exponential distribution for service rate, find :
 - (a) Average number of customers in the system.
 - (b) Average number of customers in the queue or average queue length.

- (c) Average time a customer spends in the system.
- (d) Average time a customer waits before being served.

8. In a certain game, player A has three possible courses of action L, M and N, while B has two possible choices P and Q. Payments to be made according to the choice made.

Choices	Payments
L, P	A pays B Rs. 3
L, O	B pays A Rs. 3
M, P	A pays B Rs. 2
M, Q	B pays A Rs. 4
N, P	B pays A Rs. 2
N, Q	B pays A Rs. 3

What are the best strategies for players A and B in this game?
What is the value of the game for A and B ? 15
