



A-1744
M. Sc. (I.T.) (Sem. VII) Examination
March/April – 2015
Paper - 704 : Optimization Techniques

Time : 3 Hours]

[Total Marks : 70

Instructions :

(1)

<p>નીચે દર્શાવેલ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી. Fillup strictly the details of signs on your answer book.</p> <p>Name of the Examination : <div style="border: 1px solid black; padding: 2px; display: inline-block;">M. Sc. (I.T.) (Sem. VII)</div></p> <p>Name of the Subject : <div style="border: 1px solid black; padding: 2px; display: inline-block;">Paper - 704 : Optimization Techniques</div></p> <p>Subject Code No. : <div style="border: 1px solid black; padding: 2px; display: inline-block;">1</div> <div style="border: 1px solid black; padding: 2px; display: inline-block;">7</div> <div style="border: 1px solid black; padding: 2px; display: inline-block;">4</div> <div style="border: 1px solid black; padding: 2px; display: inline-block;">4</div> Section No. (1, 2,...): <div style="border: 1px solid black; padding: 2px; display: inline-block;">Nil</div></p>	<p>Seat No. : <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> </div> <div style="border: 1px solid black; border-radius: 10px; height: 80px; margin-top: 10px; display: flex; align-items: center; justify-content: center;"> <p>Student's Signature</p> </div> </p>
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- (2) Attempt all questions.
 (3) Follow usual notations and conventions.
 (4) Figure to the right indicate marks.

1 Attempt any TWO :

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- (a) Give the condition to find optimum solution in 3 machine n jobs sequencing problem. Also find total elapsed time in following problem :

	M ₁	M ₂	M ₃	M ₄
Job-1	20	3	3	25
Job-2	12	5	1	11
Job-3	18	4	2	10
Job-4	17	2	4	28

- (b) Explain the n job 2 machine sequencing problem and find the idle time for both machine in following problem :

task	a	b	c	d	e
M ₁	8	10	6	7	11
M ₂	5	6	2	3	4

- (c) Define "number of machine".

A manufacturing company processes 6 different jobs on two machines A and B. Number of unit of each job and its processing time on A and B are given below. Find the total elapsed time and idle time for each machine.

Job	Unit of each job	Processing time	
		A	B
1	3	5	8
2	4	16	7
3	2	6	11
4	5	3	5
5	2	9	7
6	3	6	14

2 Attempt any TWO :

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- (a) Given for the following network are three time estimates for various activities. Find the critical path :

Activity	T _o	T _m	T _p
1 → 2	4	6	8
2 → 3	5	7	15
2 → 4	4	8	12
2 → 8	15	20	25
3 → 5	10	18	26
4 → 6	8	9	16
5 → 7	4	8	12
5 → 9	1	2	3
6 → 7	6	7	8
7 → 9	4	8	16
8 → 9	8	9	16

- (b) Discuss the errors occurs in network diagram with example.
- (c) Draw the network diagram for the following project and find the critical path and variance for each activity :

Activity	Preceding activity	T _o	T _m	T _p
A	-	8	4	10
B	-	2	2	2
C	A	2	1	3
D	A	6	4	12
E	A	4	3	5
F	C	3	3	3
G	C	4	3	5
H	C	6	4	9
J	B,D	8	6	16
K	F,J	1	1	1
L	E,H,G,K	8	4	10
M	E,H	3	3	3
N	L,M	4	3	5

- (a) Workers come to tool store room to receive special tools for accomplishing a particular project assign to them. The average time between two arrival is 60 seconds and the arrival are assumed to be in Poisson distribution. The average service time is 40 seconds. Find (i) average queue length (ii) mean waiting time of an arrival (iii) average waiting time of an arrival.
- (b) A mechanic repairs four machines. The mean time between service requirements is 5 hours for each machine and forms an exponential distribution. The mean repair time is one hour and also follows the same distribution pattern. Find :
- (1) Probability that the service facility will be idle.
 - (2) Expected number of machines waiting to be repaired or being repaired.
- (c) A supermarket has two salesgirls at the sales counter. If the service time for each customer is exponential with a mean of 4 minutes, and if people arrive in the Poisson fashion at the rate of 10 an hour, then calculate.
- (i) Probability that a customer has to wait for service.
 - (ii) Expected percentage of idle time for each sales girl.

- (a) A book store wishes to carry a particular book in stock. Demand is not certain and there is 2 days for stock replenishment. The prob. of demand

• Demand :	0	1	2	3	4
• Probability :	0.05	0.1	0.3	0.45	0.1

Each time an order is placed, the store incurs an ordering cost of 12 per order. The store also incurs a carrying cost of Rs. 1.0 per book per day. The inventory carrying cost is calculated on the basis of stock at the end of the day. The manager of the book store order 6 books when the present inventory plus any outstanding order falls below 10 books. Currently the store has stock of 10 books plus 6 books ordered 2 days ago and are expected to arrive next day. Carry out the simulation run for 8 days to recommend an appropriate option. Also give your advice on the option to order 8 books when the total inventory falls below 10 books.

- (b) A bakery keeps stock of a cake. Previous experiment shows that the daily demand pattern for the item with associated probabilities as given

• Daily demand :	0	10	20	30	40	50
• Probability :	0.01	0.2	0.15	0.5	0.12	0.02

Use the following two sequences of random numbers to simulate the demand for next 10 days, Random number (i) 25, 39, 65, 76, 12, 05, 73, 89, 19, 49 and (ii) 28, 34, 76, 84, 45, 67, 94, 58, 12, 08. Also estimate the daily average demand for the cakes on the basis simulated data.

- (c) What are the different types of simulation? Describe.

5 Attempt any TWO :

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- (a) Divide quantity 'b' into n parts so as to maximize their product using Dynamic programming.
- (b) Determine the value u_1, u_2, u_3 so as to

$$\text{Minimize } Z = \sum_{i=1}^3 u_i^2$$

subject to constraints

$$\sum_{i=1}^3 u_i = 15; u_1, u_2, u_3 \geq 0$$

- (c) A company has five salesmen, who have to be allocated to four marketing zones. The profit from each zones depends upon the number of salesmen working in that zone. The expected return from different number of salesmen in different zones, as estimated from the past

records given below. Determine the optimal allocation policy using dynamic programming :

No. of salesmen	Marketing zones		
	1	2	3
0	45	30	35
1	58	45	45
2	70	60	52
3	82	70	64
4	93	79	72
5	101	90	82
