



JC-1647

M. Sc. (I. T.) (Sem. VII) Examination

March/April – 2013

704 : Optimization Technique

Time : 3 Hours]

[Total Marks : 70

Instruction :

<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. 7)</div></p> <p>Name of the Subject : <div style="border: 1px solid black; padding: 2px; display: inline-block;">704 : OPTIMIZATION TECHNIQUE</div></p> <p>Subject Code No. : <div style="border: 1px solid black; padding: 2px; display: inline-block; margin: 0 2px;">1</div> <div style="border: 1px solid black; padding: 2px; display: inline-block; margin: 0 2px;">6</div> <div style="border: 1px solid black; padding: 2px; display: inline-block; margin: 0 2px;">4</div> <div style="border: 1px solid black; padding: 2px; display: inline-block; margin: 0 2px;">7</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; width: 100px;"> <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>
--	---

1 Attempt any two : 14

- (a) We have 4 jobs each of which has to go through the machines $M_j (j = 1, 2, 3, 4)$ in the order M_1, M_2, M_3, M_4 . Processing time (in hours) is given below, which gives an optimal solution of completion time of total process of all jobs through all the machines.

	Job				
	A	B	C	D	E
Machine M1	10	12	8	15	16
Machine M2	3	2	4	1	5
Machine M3	5	6	4	7	3
Machine M4	14	7	12	8	10

- (b) When passing is not allowed, solve the sequencing problem giving an optimal solution.

	Job							
	A	B	C	D	E	F	G	H
Machine M1	10	12	8	15	9	10	11	16
Machine M2	3	2	4	1	3	4	5	5
Machine M3	5	6	4	7	6	7	3	3
Machine M4	14	7	12	8	11	10	17	10

- (c) Write an algorithm for solving 3 machine m job sequence problem.

2 Attempt any two : 14

- (a) Consider a single server queuing system with Poisson input and exponential times. Suppose the mean arrival rate is 3 calling units per hour, the expected service time is 0.25 hour and the maximum permissible calling units in the system is 2. Derive the steady state probability distribution of the number of the calling units in the system, and then calculate the expected number in the system.
- (b) Arrivals at telephone are considered to be Poisson with an average time of 10 minutes between one arrival and the next. The length of phone call is assumed to be distributed exponentially, with mean 3 minutes.
- (i) What is the probability that a person arriving at the booth will have a wait ?
- (ii) The telephone department will install a second booth when consider that an arrival would expect waiting for at least 3 minutes for a phone call. By how much should the flow of arrivals increase in order to justify a second booth ?
- (iii) What is the average length of the queue that forms from time to time ?
- (c) A super market has two sales girls at the sales counters. If the service time for each customer is exponential with a mean of 4 minutes, and if people arrive in a Poisson fashion at the rate of 10 an hour, then calculate the :
- (i) Probability that a customer has to wait for service ?
- (ii) Expected percentage of idle time for each sales girl ?
- (iii) If a customer has wait, what is the expected length of his waiting time ?

3 Attempt any two : 14

- (a) Construct the network diagram comprising activities A, B, C,..., and J

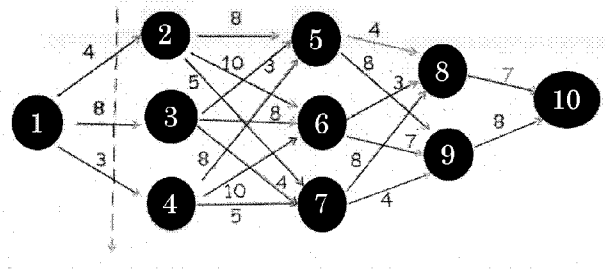
Task	Predecessor	Time (Week)
A	-	3
B	-	5
C	-	7
D	A	8
E	B	5
F	C	5
G	E	4
H	F	5
I	D	6
J	G, H	4

- (i) Draw the project network
- (ii) Find the critical path of the network
- (iii) Calculate the earliest start time and earliest finish time for each activity
- (iv) Find the float for each activity.
- (b) Discuss the rules for constructing network diagram also state the errors in network diagram.
- (c) Construct the network diagram comprising activities A, B, C,...,Q and N such that the following constraints are satisfied A, B, C > NONE; A < D; B, C < E; A < F; C < G; H < D, E, F; D < I; G < J, K; H, J < L; K < M; I, L < N;

4 Attempt any **two** :

14

- (a) If X, Y, Z, T are the sets with elements {1, 2, 3} also the conditions on sets are $X < Y$, $Y \leq Z$, $T = Z$ and $X < T$. Find the supports of X, Y, X and T using dynamic programming.
- (b) Determine the value u_1, u_2, u_3 so as to minimize $z = u_1^2 + u_2^2 + u_3^2$ subject to constraints
 $u_1 + u_2 + u_3 = 15$
 $u_1, u_2, u_3 \geq 0$
- (c) Alternative routes from city A to city B. he then draw a highway network map as shown in figure.



The city of origin A, is 1. The destination city B, is city 10. Other cities through which the salesman will have to pass through are numbered 2 to 9. The arrow representing routes between cities and distances in kilometers are indicated on each route. The salesman's problem is to find the shortest route that covers all the selected cities from A and B.

5 Attempt any **one** :

14

- (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 10 per order. The store also incurs a carrying cost of Rs. 0.5 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 wishes to compare two options for his inventory decision.

A : Order 5 books when the present inventory plus any outstanding order falls below 8 books.

B : Order 8 books when the present inventory plus any outstanding order falls below 8 books.

C : Order 6 books when the present inventory plus any outstanding order falls below 10 books.

Currently the store has a stock of 8 books plus 7 books ordered 2 days ago and are expected to arrive next day. Carrying the simulation run for 10 days to recommend an appropriate option. Random number in the sequence 80, 31, 70, 61, 2, 8, 39, 51, 13, 73.

- (b) A project consists of eight activity A to H, the completion time for each activity is random variable and is as follows :

Activity	Predecessors	Time / Probability								
		1	2	3	4	5	6	7	8	9
A	-	-	-	-	0.2	-	0.4	0.4	-	-
B	-	-	-	-	-	-	0.5	-	0.5	-
C	A	-	-	0.7	0.3	-	-	-	-	-
D	B, C	-	-	-	-	0.9	-	-	0.1	-
E	A	-	-	-	-	0.2	-	-	-	0.8
F	D, E	-	-	-	0.6	0.4	-	-	-	-
G	E	-	-	0.4	0.4	-	0.2	-	-	-
H	F	-	0.4	-	-	-	-	0.6	-	-

- Draw the network diagram and identify the critical path.
- Stimulate the project to determine the activity times.
- Determine the critical path and project expected completion time.
- Repeat the simulation four times and state the estimated duration of the project in each of the trial.