



K-1643

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

October / November – 2012

I. T. - 704 : Optimization Technique

Time : 3 Hours]

[Total Marks : 70

Instruction :

નીચે દર્શાવેલ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of signs on your answer book.

Name of the Examination :
M. SC. (SEM. 7) (I. T.)

Name of the Subject :
I. T. - 704 : OPTIMIZATION TECHNIQUE

Subject Code No. : 1 6 4 3 Section No. (1, 2,.....) : Nil

Seat No. :

Student's Signature

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 machine.

	Machines			
	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) When passing is not allowed, solve the sequencing problem find the optimal Solution if possible

	Jobs				
	A	B	C	D	E
Machine M1	33	24	35	23	12
Machine M2	43	54	34	23	54
Machine M3	53	43	54	65	43
Machine M4	23	43	54	26	27

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

2 Attempt any two

14

- (a) 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?

- (b) A warehouse has only one loading dock manned by a three person crew. Trucks arrive at the loading dock at an average rate of 4 trucks per hour and the arrival rate is Poisson distributed. The loading of a truck takes 10 minutes on an average and can be assumed to be exponentially distributed. The operating cost of truck is Rs 20 per hour and the members of the loading crew are paid @ Rs 6 each per hour. Would you advise the truck owner to add another crew of three people?
- (c) 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

3 Attempt any two

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- (a) Discuss the rules for constructing network diagram also state the errors in network diagram.

- (b) Project consist of eight activities with the following relevant information

Activity	Immediate predecessor	Estimated duration (days)		
		Optimistic	Most likely	Pessimistic
A	-	1	1	7
B	-	1	4	7
C	-	2	2	8
D	A	1	1	1
E	B	2	5	14
F	C	2	5	8
G	D, E	3	6	15
H	F, G	1	2	3

Then

- (1) draw the network and find out the expected project completion time
- (2) find the critical path of the network
- (3) calculate the earliest start time and earliest finish time for each activity
- (4) find the float for each activity
- (5) find the variance of the each activity

- (c)

Activity	To	Tm	Tp
1 → 2	3	4	5
1 → 3	1	2	3
2 → 3	6	8	10
2 → 4	0	0	0
2 → 5	2	5	8
3 → 4	3	5	7
4 → 7	6	9	12
5 → 6	1	1	1
5 → 7	2	5	8
6 → 7	4	8	12

Project consist of eight activities with the relevant information given in the above table then (1) Draw the project network

(2) Find the critical path of the network

(3) Calculate the earliest start time and earliest finish time for each activity

(4) Find the float for each activity

4 Attempt any two

14

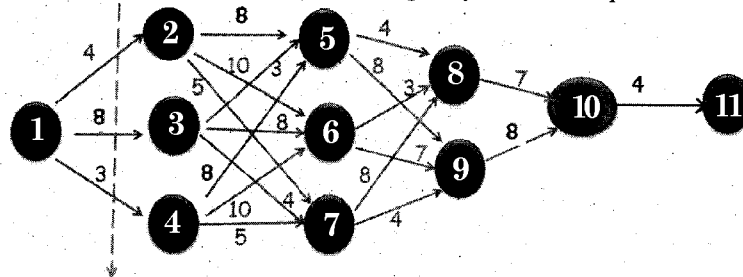
- (a) Determine the value u_1, u_2, u_3 so as to minimize $z = u_1^2 + u_2^2 + u_3^2$ subject to constraints

$$u_1 + u_2 + u_3 = 25$$

$$u_1, u_2, u_3 \geq 0$$

- (b) If X, Y, Z, T are the sets with elements {1, 2, 3} the conditions on a sets are $X < Y$, $Y \leq Z$, $T = Z$ and $X < T$. find the supports of X, Y, X & T using dynamic programming

- (c) Alternative routes form city 1 to city 11. A highway network map as shown in figure



The city of origin is 1 and the destination city is city 11. Other cities through which the salesman will have to pass through are numbered 2 to 10. The arrow representing routes between cities and distances in kilometers. find the **longest route** form 1 and 11

5 Attempt any one

14

- (a) A book store wishes to carry a particular book in stoke. Demand is not certain and there is 2 days for stoke 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 or Rs. 0.5 per book par day. The inventory carrying cost is calculated on the basis of stoke 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 tore has a stake 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 events 1 to 6. the completion time for each activity is random variable and is as follows:

I – Event	J – Event	Time /probability								
		1	2	3	4	5	6	7	8	9
1	2	-	-	-	0.2	-	0.4	0.4	-	-
1	3	-	-	-	-	-	0.5	-	0.5	-
1	4	-	-	0.7	0.3	-	-	-	-	-
2	5	-	-	-	-	0.9	-	-	0.1	-
3	5	-	-	-	-	0.2	-	-	-	0.8
4	6	-	-	-	0.6	0.4	-	-	-	-
5	6	-	-	0.4	0.4	-	0.2	-	-	-

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