



**RJ-1749**  
**M. Sc. (I.T.) (Sem. VII) Examination**  
**March / April - 2017**  
**704 : Optimization Techniques**

Time : Hours]

[Total Marks : 70]

### **Instructions : (1)**

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

**Name of the Examination :**

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

Name of the Subject :-

→ 704 : OPTIMIZATION TECHNIQUES

Subject Code No.: **1 7 4 9** Section No. (1, 2,.....): **NIL**

Seat No.:

A horizontal row of six empty rectangular boxes, likely intended for a child to draw or write in.

Student's Signature

- (2) Attempt all questions.  
(3) Figure to the right indicate marks.  
(4) Follow the usual notations and conventions.

**1      Attempt any two :**

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- (a) A branch of Punjab national bank has only one typist. Since the typing work varies in length, the typing rate is randomly distributed approximating a Poisson distribution with mean service rate of 8 letters per hour. The letter arrive at the rate of 5 per hour during the entire 8-hour work day. If the typewriter values at Rs. 1.50 per hour, determine : (a) Average system line, (b) Average cost due to waiting on the part of typewriter.

(b) In machine maintenance, 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 machine down time costs Rs. 25 per hour and machine costs Rs. 55 per day of hour. (a) Find the expected number of operating machines. (b) Would it be economical to engage two mechanics each repairing only two machines ?

(c) Telephone users arrive at a booth following a Poisson distribution with an average time of 5 minutes between one arrival and the next. The time taken for a telephone call is on an average 3 minutes and it follows an

exponential distribution. What is the probability that the booth is busy ? How many more booths should be established to reduce the waiting time to less than or equal to half of the waiting time ?

**2** Attempt any two :

**14**

- (a) In the machine shop, 8 different products are being manufactured each requiring time on two Machine A and B as given below :

<i>Product</i>	<i>Time on Machine A</i>	<i>Time on Machine B</i>
I	30	20
II	45	30
III	15	50
IV	20	35
V	80	36
VI	120	40
VII	65	50
VIII	10	20

Decide the optimum sequence of processing of different products in order to minimize the total manufacturing time.

- (b) We have five jobs, each of which must go through Machines A, B and C. Find the optimal sequence. Processing times are given in the following table :

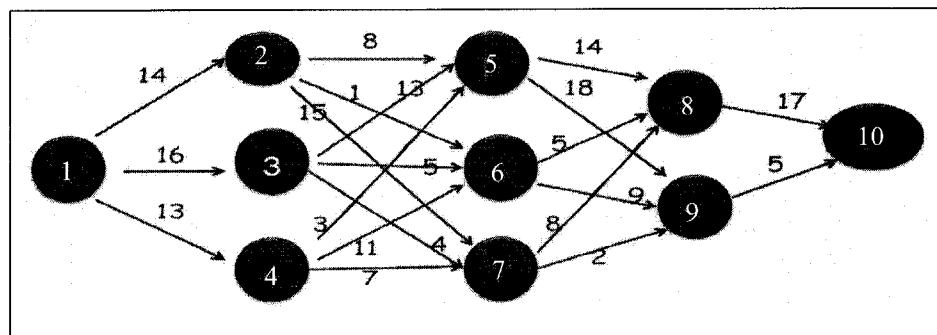
Job :	1	2	3	4	5
Machine A :	8	10	6	7	11
Machine B :	5	6	2	3	4
Machine C :	4	9	8	6	5

- (c) What are the conditions to find optimum solution in 3 machine n jobs sequencing problem.

**3** Attempt any two :

**14**

- (a) A salesman located in a city A decided to travel to city B. He know that the distances of alternative routes form 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.



- (b) Use Dynamic programming to solve

$$\text{Min } Z = \sum_{i=1}^3 y_i^2 \text{ where } \sum_{i=1}^3 y_i \geq 15 \text{ for each } y_i \geq 0.$$

- (c) Divide quantity ' $m$ ' into ' $n$ ' parts so as to maximize their product.

**4** Attempt any two :

**14**

- (a) Use graphical method to solve

$$\text{Maximize } Z = x + y + 3z$$

Subject to constraints :

$$3x + 2y + z \leq 3, 2x + y + 2z \leq 2 \text{ and } x, y, z \geq 0.$$

- (b) A gas transport company controls pipelines between several natural gas fields and out of state distribution. The company has a 1,00,000 unit storage capacity. Because of certain government regulations, the company receives either 40,000 or 60,000 units per day but the probability of receiving

such quantity is not equal. The actual demand for natural gas is given by the following table :

<i>Daily Demand</i>	<i>Probability</i>
25,001 - 45,000	0.30
45,000 - 55,000	0.30
55,000 - 65,000	0.40

What is the expected daily demand ?

- (c) State the advantages of simulation.

5 Attempt any **one** :

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- (a) A project is composed of nine activities whose time estimates are listed in the table as follows :

<i>i</i>	<i>j</i>	<i>Duration (Days)</i>		
		<i>Optimistic</i>	<i>Most Likely</i>	<i>Pessimistic</i>
1	2	3	6	15
1	6	2	5	14
2	3	6	12	30
2	4	2	5	8
3	5	5	11	17
4	5	3	6	15
6	7	3	9	27
5	8	1	4	7
7	8	4	19	28

Calculate the length and variance of the critical path.

- (b) Find the critical path for the following set of time estimates.

<i>Activity</i>	<i>Immediate Predecessor</i>	<i>Set-1</i>	<i>Set-2</i>
A	-	4	3
B	-	8	8
C	A	11	9
D	B	6	6
E	C	11	10
F	C	18	14
G	C, D	11	11
H	F, G	14	10
I	E	6	5
J	I	5	4
K	H	1	1