

SUBJECT : OPERATION RESEARCH

Day : Thursday  
Date : 16/11/2017

W-2017-1679

Time : 10.00 AM TO 01.00 PM  
Max. Marks : 100

N. B. ;

- 1) Attempt ANY FOUR questions from Section – I and ANY TWO questions from Section – II.
- 2) Figures to the right indicate FULL marks.
- 3) Answers to both the sections should be written in SEPERATE answer books.
- 4) Use of non – programmable CALCULATOR is allowed.

SECTION - I

Q.1 What are the different types of models used in operation research? Explain in detail. (15)

Q.2 Use the graphical method to solve the following Linear Programming Problem (15)

$$\begin{aligned} \text{Maximize } Z &= 40x_1 + 35x_2 \\ \text{Subject to } 2x_1 + 3x_2 &\leq 60 \\ 4x_1 + 3x_2 &\leq 96 \\ \text{and } x_1, x_2 &\geq 0 \end{aligned}$$

Q.3 Assign workers 1, 2, 3, 4 to jobs A, B, C, D. Time taken by workers for different jobs are given in the matrix: (15)

Workers	Jobs			
	A	B	C	D
1	45	40	51	67
2	55	40	61	53
3	49	52	48	64
4	41	45	60	55

Q.4 A businessman has two independent investments. A and B available to him, but he lacks the capital to undertake both of them simultaneously. He can choose to take A first and then stop, or if A is successful, then take B or vice versa. The probability of success on A is 0.7, while for B it is 0.4. Both investments require an initial capital outlay of Rs. 2000/- and both return nothing, if the venture is unsuccessful. Successful completion of A will return Rs. 3,000/- (over cost), where as successful completion of B will return Rs, 5,000/- (over cost). Draw the decision tree and determine the best strategy. (15)

Q.5 Solve the given problem by using VAM. (15)

To From	D	E	F	Supply
A	6	4	1	50
B	3	8	7	40
C	4	4	2	60
Demand	20	95	35	

Q. 6 Draw a network diagram of activities for the project (15)

<b>Activity</b>	A	B	C	D	E	F	G	H
<b>Predecessor Activity</b>	-	A	A	B	B, C	E	D, F	G

Q. 7 Write short notes on the following: (15)

- a) Application of LPP
- b) Models of Operation Research
- c) Methods of Transportation problem

**SECTION - II**

Q. 8 At a service counter of fast – food joint, the customers arrive at the average interval of six minutes whereas the counter clerk takes on an average 5 minutes for preparation of bill and delivery of the item. Calculate the following: (20)

- i) Counter utilization level.
- ii) Average waiting time of the customers at the fast food joint.
- iii) Expected average waiting time in the line.
- iv) Probability that the counter clerk is idle.
- v) Probability of finding the clerk busy.

Q. 9 Use the simplex method to solve the following LPP: (20)

Maximize  $Z = 30x_1 + 40x_2$

Subject to constraints

$60x_1 + 120x_2 \leq 12000$

$8x_1 + 5x_2 \leq 600$

$3x_1 + 4x_2 \leq 500$

and  $x_1, x_2 \geq 0$

Q.10 For a small project of 12 activities, the details are given below. Draw the network and find earliest occurrence time, latest time, critical activities and project completion time. (20)

<b>Activity</b>	A	B	C	D	E	F	G	H	I	J	K	L
<b>Dependence</b>	-	-	-	B & C	A	C	E	E	D, F, H	E	I, J	G
<b>Duration (Days)</b>	9	4	7	8	7	5	10	8	6	9	10	2