Seventh Semester B.E. Degree Examination, June/July 2016
Operations Research

Time: 3 hrs.   Max. Marks:100

Note: *Answer any FIVE full questions, selecting*
atleast TWO questions from each part.

PART – A

1 a. Write a note on the scope and limitations of OR. **(06 Marks)**

   b. A paper mill produces two grades of paper namely X and Y. Because of raw material restrictions, it cannot produce more than 400 tons of grade X and 300 tins of grade Y in a week. There are 160 production hours in a week. It requires 0.2 and 0.4 hours to produce a ton of products X and Y respectively with corresponding projects of RS 200 and Rs 500 per ton. Formulate the above as a LPP to maximize project and find the optimum product mix. **(04 Marks)**

   c. By graphical method solve the following LPP :

Maximize $Z = 3x_1 + 4x_2$

Subject to $\quad 5x_1 + 4x_2 \leq 200$

$\qquad\qquad 3x_1 + 5x_2 \leq 150$

$\qquad\qquad 5x_1 + 4x_2 \geq 100$

$\qquad\qquad 8x_1 + 4x_2 \geq 80$

and $x_1, x_2 \geq 0.$ **(10 Marks)**

2 a. Maximize $Z = 3x_1 + 2x_2 + 5x_3$

Subject to $\qquad x_1 + 2x_2 + x_3 \leq 430$

$\qquad\qquad 3x_1 + 2x_3 \leq 460$

$\qquad\qquad x_1 + 4x_2 \leq 420$

$\qquad\qquad x_1, x_2, x_3 \geq 0.$ **(10 Marks)**

   b. Use Penalty method to

Maximize $Z = 3x_1 - x_2$

Subject to $\qquad 2x_1 + x_2 \geq 2$

$\qquad\qquad x_1 + 3x_2 \leq 3$

$\qquad\qquad x_2 \leq 4$

$\qquad\qquad x_1, x_2 \geq 0.$ **(10 Marks)**

3 a. Determine an initial basic feasible solution for the following TP using VAM. **(10 Marks)**

Destination

		D$_1$	D$_2$	D$_3$	D$_4$	Supply
	F$_1$	3	3	4	1	100
Factory	F$_2$	4	2	4	2	125
	F$_3$	1	5	3	2	75
Demand		120	80	75	25	300

   b. Find the IBFS by LCM and check the optimal solution by stepping stone method.

	D	E	F	G	Capacity
A	4	6	8	6	700
B	3	5	2	5	400
C	3	9	6	5	600
Requirement	400	450	350	500	

(10 Marks)

4 a. Write the difference between transportation problem and assignment problem. **(04 Marks)**

b. Solve the following assignment problem :

	I.	II	III	IV	V
1	11	17	8	16	20
2	9	7	12	6	15
3	13	16	15	12	16
4	21	24	17	28	26
5	14	10	12	11	13

(08 Marks)

c. Find the least cost for the travelling salesman problem.

	1	2	3	4	5
1	∞	16	4	12	∞
2	16	∞	6	∞	8
3	4	6	∞	5	6
4	12	∞	5	∞	20
5	∞	8	6	20	∞

(08 Marks)

PART – B

5 a. Find the sequence for the following eight jobs, that minimizes the total elapsed time for completion of all jobs, each job being processed in the order CAB. Find the total elapsed time and idle time of each machine. **(10 Marks)**

Jobs

		1	2	3	4	5	6	7	8
	A	4	6	7	4	5	3	6	2
Machines	B	8	10	7	8	11	8	9	13
	C	5	6	2	3	4	9	15	11

b. A workshop has six machines and two jobs the processing time on each machine and technological sequence of jobs is given below :

Job 1	M/c sequence	A	C	D	B	E	F
	time (hrs)	20	10	10	30	25	15

Job 2	M/c sequence	A	C	B	D	F	E
	time (hrs)	10	30	15	10	15	20

What would be the optimal scheduling to minimize the total processing time for these two jobs? Find also the total Elapsed time. **(10 Marks)**

6 a. Use the dominance principle to solve the following game : **(10 Marks)**

	I	II	III	IV
1	20	15	12	35
2	25	14	8	10
3	40	2	19	5
4	5	4	11	0

b. Solve the following game using graphical method : **(10 Marks)**

$$
\begin{array}{c}
 & \begin{array}{cc} B_1 & B_2 \end{array} \\
\begin{array}{c} A_1 \\ A_2 \\ A_3 \\ A_4 \\ A_5 \end{array} &
\left(\begin{array}{cc}
-6 & 7 \\
4 & -5 \\
-1 & -2 \\
-2 & 5 \\
7 & -6
\end{array}\right)
\end{array}
$$

7 a. Telephone users arrive at a booth following a Poisson distribution with an average time of 5 minute between one arrival and the next. The time taken for a telephone call is an average 3 minute and it follows an exponential distribution. What is the probability that the booth is busy? How many more booth should be established to reduce the waiting time to less than or equal to half of the present waiting time? **(06 Marks)**

b. Customers arrive at a box office window being managed by a single individual according to a Poisson input process with mean rate 30 per hour. The time required to serve a customer has an exponential distribution with a mean of 90 seconds. Find the average waiting time of a customer. Also determine the average number of customers in the system and average queue length. **(06 Marks)**

c. Describe the characteristics of queuing system. **(08 Marks)**

8 a. Write the differences between PERT and CPM. **(04 Marks)**

b. The following table shows the jobs of a project with their duration in days. Draw the network and determine the critical path. Also calculate all the floats.

Jobs	1 – 2	1- 3	1 – 4	2 – 5	3 – 7	4 – 6	5 – 7	5 – 8
Duration	10	8	9	8	16	7	7	7

Jobs	6 – 7	6 – 9	7 – 10	8 – 10	9 – 10	10 –11	11 –12
Duration	8	5	12	10	15	8	5

(16 Marks)

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