Roll No. | | | | | | | | | | | | | **Total No. of Pages : 03**

Total No. of Questions : 07

B.Com. (2011 & Onward) (Sem.–3)

OPERATION RESEARCH

Subject Code : BCOP-304

Paper ID : [B1127]

Time : 3 Hrs. **Max. Marks : 60**

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains SIX questions carrying TEN marks each and students have to attempt any FOUR questions.**

SECTION–A

1. Write briefly :

a) Is the set S = $\{(x_1, x_2) : 0 < x_1^2 + x_2^2 \le 4\}$ convex? Justify your answer.

b) What is the necessary and sufficient condition for the existence of a feasible solution to an $m \times n$ transportation problem?

c) Find all basic solutions for the system

$$x_1 + 2x_2 \le 6$$
$$3x_1 - x_2 \le 7; \quad x_1, x_2 \ge 0$$

d) While solving an LPP, maximize Z = CX, s.t. AX = b, X $\ge$ 0, $b \ge 0$, what indicates "unbounded solution".

e) Explain the following terms.

(i) Total float

(ii) Independent float.

f) Explain the meaning of 'Crashing' in network techniques.

g) Explain the four elements that characterize sequencing problem.

h) Prove that the dual of the given primal, is the primal.

i) Write the dual of

Minimize $Z = 4x_1 - 8x_2$

s.t. $2x_1 + 6x_2 = 3$

$x_1 + 4x_2 \le 6; \quad x_1, x_2$ – unrestricted.

j) Write three major limitations of Operation Research.

SECTION–B

2. Solve the following problem using two-phase method :

Minimize $Z = 3x_1 + x_2 - 2x_3$

s.t. $4x_1 + 2x_2 - x_3 \leq 1$

$x_1 + x_2 + x_3 = 5$

$2x_2 + 4x_3 = 3;\ x_1, x_2, x_3 \geq 0$

3. Write the dual of given primal problem. Solve the dual problem using simplex methods and then write the solution of primal problem.

Maximize $Z = 8x_1 + x_2$

s.t. $8x_1 + x_2 \leq 8$

$2x_1 + x_2 \leq 6$

$3x_1 + x_2 \leq 6$

$x_1 + 6x_2 \leq 8;\ x_1, x_2, \geq 0$

4. Reduce the following game by dominance property and solve it :

	1	**2**	**3**	**4**	**5**
I	1	2	7	3	4
II	3	4	1	6	5
III	5	6	7	5	6
IV	0	2	1	3	2

5. Solve the following transportation problem to get an optimum solution :

	D_1	**D_2**	**D_3**	**D_4**	**Available**
O_1	2	3	1	2	40
O_2	5	4	2	6	60
O_3	3	9	7	2	80
Demand	10	40	60	20	

6. A small workshop undertaking repair of damaged cars has one denter and one painter. Presently there are 6 cars needing repair. The following estimates in hours of time needed for denting and painting on the cars are available.

Car –	1	2	3	4	5	6
Denting time –	4	7	3	12	11	9
Painting time –	11	7	10	8	10	13

What is the sequence that completes all the jobs in minimum time? What is the corresponding schedule of jobs?

7. Consider the network given in following data :

Activity –	A	B	C	D	E	F	G	H	I	J
Immediate Predecessor –	–	A	A	A	B	C,D	D	B	E,F,G	G
Activity Duration (days) –	2	3	4	5	6	3	4	7	2	3

(i) Draw the network

(ii) Find critical path

(iii) Find free floats and Total floats of each activity.