K16U 0207

Reg. No. : .....

Name : .....

VI Semester B.Sc. Degree (CCSS – Reg./Supple./Improv.) Examination, May 2016

CORE COURSE IN MATHEMATICS

6B14 MAT (3) : Operation Research (Elective)

Time : 3 Hours Max. Weightage : 30

1. Fill in the blanks :
   a) Any solution to a general LPP which also satisfy the non-negative restrictions of the problem is called a _____ to the general L.P.P.
   b) When the total demand is equal to total supply then the transportation problem is said to _____
   c) A pair of strategies (p, q) for which $\underline{v} = \overline{v} = v$ is called a _____ of E(p, q).
   d) Time interval between starting the first job and completing the last job including the idle time in a particular order by the given set of machines is called _____ **(W – 1)**

Answer **any six** from the following (wt : **1 each**)

2. Define a convex function. Give an example.
3. For a general LPP define the following :
   a) Slack variables
   b) Surplus variables.
4. State the fundamental theorem of duality.
5. Define the "loop" associated with a transportation problem.
6. State the reduction theorem in an assignment problem.

P.T.O.

7. What is game theory ? What are the various types of games ?
8. Explain the "Maximin-Minimax Principle".
9. Give the mathematical formulation of an assignment problem.
10. Define Primal Problem and Dual Problem. **(6×1=6)**

Answer **any 7** from the following (wt : **2 each**) :

11. Show that the set $S = \{(x_1, x_2) : 3x_1^2 + 2x_2^2 \leq 6\}$ is convex.
12. Use graphical method to solve the LPP

    Maximise $Z = 2x_1 + 4x_2$ subject to

    $x_1 + 2x_2 \leq 5$;

    $x_1 + x_2 \leq 4$;

    $x_1, x_2 \geq 0$
13. State the general linear programming problem :
    a) Standard form
    b) Canonical form.
14. Explain the dual simplex method.
15. Formulate the dual of the following LPP :

    Maximise $Z = 5x_1 + 3x_2$ subject to the constraints

    $3x_1 + 5x_2 \leq 15$;

    $5x_1 + 2x_2 \leq 10$;

    $x_1, x_2 \geq 0$.
16. State and prove a necessary and sufficient condition for the existence of a feasible solution to the general transportation problem.
17. Explain the least-cost method.

18. Find the starting solution in the following transportation problem by North-West Corner Method.

	D_1	D_2	D_3	D_4	Supply
S_1	3	7	6	4	5
S_2	2	4	3	2	2
S_3	4	3	8	5	3
Demand	3	3	2	2	

19. State and prove Reduction theorem in an Assignment Problem.

20. For the game with the following payoff matrix determine, the optimum strategies and the value of the game $P_1\begin{bmatrix} 5 & 1 \\ 3 & 4 \end{bmatrix}$ P_2. **(7×2=14)**

Answer **any 3** questions from the following (wt : **3 each**) :

21. Use duality to solve the following L.P.P.

Maximize $Z = 2x_1 + x_2$ subject to the constraints

$x_1 + 2x_2 \leq 10$,

$x_1 + x_2 \leq 6$,

$x_1 - x_2 \leq 2$,

$x_1 - 2x_2 \leq 1$

$x_1, x_2 \geq 0$.

22. Use simplex method to solve the following LPP

Max. $Z = 3x_1 + 5x_2 + 4x_3$ subject to the constraints

$2x_1 + 3x_2 \leq 8$

$2x_2 + 5x_3 \leq 10$

$3x_1 + 2x_2 + 4x_3 \leq 15$

$x_1, x_2, x_3 \geq 0$

23. A company has factories at F_1, F_2 and F_3 which supply to warehouse at W_1, W_2 and W_3. Weekly factory capacities are 200, 160 and 90 units respectively. Weekly warehouse requirements are 180, 120 and 150 units respectively. Unit shipping cost (in rupees) are as follows :

		Warehouse			
		W_1	W_2	W_3	Supply
Factory	F_1	16	20	12	200
	F_2	14	8	18	160
	F_3	26	24	16	90
	Demand	180	120	150	450

Determine the optimum distribution for this company to minimize shipping costs.

24. In a factory there are six jobs to perform each of which should go through two machines A and B in the order A, B. The processing timings (in hours) for the jobs are given here. You are required to determine the sequence for performing the jobs that would minimize the total elapsed time T. What is the value of T ?

Job	J_1	J_2	J_3	J_4	J_5	J_6
Machine A	1	3	8	5	6	3
Machine B	5	6	3	2	2	10

25. Solve the following game by the Dominance Property.

		Player B			
		I	II	III	IV
Player A	I	3	2	4	0
	II	3	4	2	4
	III	4	2	4	0
	IV	0	4	0	8

(3×3=9)