M 8166

Reg. No. : .....

Name : .....

VI Semester B.Sc. Degree (CCSS-Reg./Supple./Improv.) Examination, May 2015
CORE COURSE IN MATHEMATICS
6B14 MAT : Operation Research (Elective)

Time: 3 Hours Max. Weightage : 30

1. Fill in the blanks :
   a) A feasible solution to a L.P.P. which is also a basic solution to the problem is called a _____ to the L.P.P.
   b) The dual of the dual is _____
   c) A necessary and sufficient condition for the existence of a feasible solution to a transportation problem is that _____
   d) _____ of a payoff matrix is that position in the pay off matrix where the maxima of row minima coincides with the minimum of the column maxima.

(W : 1)

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

2. Define a hyper sphere in R^n with centre a and radius t. Write the equation for hyper sphere in R^n.
3. For an LPP define the following :
   i) Basic solution
   ii) Degenerate basic solution.
4. State the basic duality theorem.
5. Write the necessary and sufficient condition for a basic feasible solution to a LPP to be an optimum (maximum).
6. Define the term "loop" associated with a transportation problem.
7. Determine the saddle point of the pay off matrix $A \begin{matrix} \\ \\ \end{matrix} \begin{matrix} B \\ \begin{bmatrix} 0 & 2 \\ -1 & 4 \end{bmatrix} \end{matrix}$.
8. Give the mathematical formulation of an assignment problem.

P.T.O.

9. What is "no passing rule" in a sequencing algorithm ?

10. Explain the "Modified Dominance Property". **(6×1=6)**

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

11. State the general linear programming problem in
    a) Standard form
    b) Standard form in matrix form.

12. Let f(x) be a convex function on a convex set S. Then prove that the set of points in S at which f(x) takes on its global minimum is a convex set.

13. Using graphical method solve the following

    Max : $z = 4x_1 + 3x_2$ subject to

    $2x_1 + x_2 \leq 1000$

    $x_1 + x_2 \leq 800$

    $x_1 \leq 400, x_2 \leq 700$

    $x_1 \geq 0$ and $x_2 \geq 0$.

14. Explain different steps involved is simplex algorithm.

15. Write the dual of the L.P.P.

    Max. : $z = 5x_1 + 3x_2$ subject to

    $3x_1 + 5x_2 \leq 15$; $5x_1 + 2x_2 \leq 10$, $x_1 \geq 0, x_2 \geq 0$.

16. A department head has four tasks to be performed and three subordinates, the subordinates differ in efficiency. The estimate of the time, each subordinate would take to perform is given below in the matrix. How should he allocate the tasks one to each man, so as to minimize the total man-hours ?

Task	Hen		
	1	2	3
I	9	26	15
II	13	27	6
III	35	20	15
IV	18	30	20

17. For the game with the following payoff matrix, determine the optimum strategies and the value of the game.

$$\begin{array}{c} \\ P_1 \end{array} \begin{array}{c} P_2 \\ \begin{bmatrix} 5 & 1 \\ 3 & 4 \end{bmatrix} \end{array}$$

18. Explain the method of solving a zero-sum two-person game as a linear programming.

19. Obtain an initial basic feasible solution to the transportation problem by North-West Corner method.

	D	E	F	G	Available
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Requirement	200	225	275	250	

20. Write an explanatory note on the matrix minima method. **(7×2=14)**

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

21. Using simplex method find

Max : $z = 4x_1 + 10x_2$ subject to

$2x_1 + x_2 \leq 50$, $2x_1 + 5x_2 \leq 100$; $2x_1 + 3x_2 \leq 90$, $x_1 \geq 0 + x_2 \geq 0$.

22. Use Vogel's approximation method to obtain an initial basic feasible solution of the transportation problem.

	D	E	F	G	Available
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Demand	200	225	275	250	

23. Solve the following 2 x 2 game graphically.

		Player B			
		B_1	B_2	B_3	B_4
Player A	A_1	2	1	0	−2
	A_2	1	0	3	2

24. A book binder has one printing press, one binding machine and the manuscripts of a number of different books. The time required to perform the printing and binding operation for each book is shown below. Determine the order in which books should be processed, in order to minimize the total time required to turn out all the books.

Book	1	2	3	4	5	6
Printing time (hrs)	30	120	50	20	90	100
Binding time (hrs)	80	100	90	60	30	10

25. A company wishes to assign 3 jobs to 3 machines in such a way that each job is assigned to some machine and no machine works on more than one job. The cost of assigning job i to machine j is given by the matrix below (ij^{th} entry).

Cost matrix : $\begin{bmatrix} 8 & 7 & 6 \\ 5 & 7 & 8 \\ 6 & 8 & 7 \end{bmatrix}$

Draw the associated network. Formulate the network LPP and find the minimum cost of making the assignment. **(3×3=9)**
