M 489

Reg. No. : .....

Name : .....

VI Semester B.A./B.Sc./B.Com./B.B.A./B.B.A. T.T.M./B.B.M./B.C.A./B.S.W./ B.A. Afsal Ul Ulama Degree (CCSS – Regular) Examination, April 2012

CORE COURSE IN MATHEMATICS

6B 14 MAT (3) : Operation Research (Elective)

Time : 3 Hours Max. Weightage : 30

***Instruction** : Answer to **all** questions.*

1. Fill in the blanks :
   a) A necessary and sufficient condition for the existence of a feasible solution to the general transportation problem is _____
   b) The dual of the dual is _____
   c) The standard Hungarian Assignment method deals with _____ types of problems.
      i) Maximisation ii) Minimisation iii) None of these
   d) _____ is a position of an element in the pay off matrix which is the minimum in its row and maximum in its column. **(Wt – 1)**

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

For an L.P.P. define the following :

2. a) Basic feasible solution.
   b) Degenerate basic solution.
3. Define the term "loop" associated with a transportation problem.
4. Define the following terms used in sequencing.
   a) Total elapsed time
   b) Idle time on a machine
5. Define the term "pay off" matrix in game theory.
6. State whether the following game matrix has a saddle point.

$$\begin{bmatrix} 1 & 0 \\ -1 & 3 \end{bmatrix}.$$

7. Explain "Principle of dominance" in game theory.
8. Define a convex function.

P.T.O.

9. Express $x_1^2 + 2x_2^2 - 7x_3^2 - 4x_1x_2 + 6x_1x_3 - 5x_2x_3$ in the form X^TAX.

10. Write the necessary and sufficient condition of a basic feasible solution to an LPP to be optimum. **(W – 6×1=6)**

Answer **any 7** questions from the following **(Weightage – 2 each) :**

11. Prove that the set of feasible solutions to an LPP is a convex set.

12. Explain different steps involved in a simplex algorithm.

13. Use graphical method to solve the L.P.P. :
Maximise $z = 2x_1 + 4x_2$ subject to the constraints $x_1 + 2x_2 \leq 5$, $x_1 + x_2 \leq 4$; $x_1, x_2 \geq 0$.

14. Compare the Canonical and standard forms of an L.P.P.

15. Formulate the dual of the following linear programming problem :
Maximize $z = 5x_1 + 3x_2$ subject to the constraints $3x_1 + 5x_2 \leq 15$; $5x_1 + 2x_2 \leq 10$, $x_1 \geq 0$ and $x_2 \geq 0$.

16. Find the initial feasible solution to the transportation problem given below, by north west :

Corner method

Origin	DESTINATION			Supply
O_1	2	7	4	5
O_2	3	3	1	8
O_3	5	4	7	7
O_4	1	6	2	14
Demand	7	9	18	

17. Solve the following minimal assignment problem :

JOB	MAN			
I	12	30	21	15
II	18	33	9	31
III	44	25	24	21
IV	23	30	28	14

18. Write an explanatory note on the least lost method with reference to a Transportation problem.

19. Find a sequence that will minimise the total time required in performing the following jobs on the machine A and B in order AB. Processing times in hours are as given below :

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

20. The following is a pay off matrix :

$$\begin{matrix} & Y \\ X & \begin{bmatrix} 1 & -2 \\ 2 & -1 \end{bmatrix} \end{matrix}$$

What is the value of the game ? Who will be winner of the game ? Why ? **(W – 7×2=14)**

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

21. Solve using simplex method :

Maximise $Z = 5x_1 + 3x_2$

Subject to $x_1 + x_2 \leq 2$

$5x_1 + 2x_2 \leq 10$

$3x_1 + 8x_2 \leq 12$

$x_1, x_2 \geq 0.$

22. Use dual complex method to solve the following LPP :

Minimize $z = 3x_1 + x_2$ subject to $x_1 + x_2 \geq 1$; $2x_1 + 3x_2 \geq 2$, $x_1, x_2 \geq 0$.

23. Solve the following transportation problem by Vogel's method :

		To I	II	III	Supply
	1	2	7	4	5
From	2	3	3	1	8
	3	5	4	7	7
	4	1	6	2	14
	Demand	7	9	18	

24. Solve graphically the game whose pay off matrix is :

	B_1	B_2	B_3	B_4	B_5
A_1	2	– 4	6	– 3	5
A_2	– 3	4	– 4	1	0

25. Use graphical method to minimize the time added to process the following jobs on the machines shown, u, for each machine find the job which should be done first . Also calculate the total time elapsed to complete both the jobs :

Job_1	Sequence	A	B	C	D	E
	Time	3	4	2	6	2
Job_2	Sequence	C	B	A	D	E
	Time	5	4	3	2	6

(W – 3×3=9)