M 3141

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 – Reg./Supple./Improv.) Examination, May 2013

Core Course in Mathematics

6B14 MAT : Elective – 3: OPERATION RESEARCH

Time : 3 Hours Max. Weightage : 30

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

1. Fill in the blanks.

   a) The number of extreme points of a convex set of feasible solution is _____

   b) The dual of the dual is _____

   c) Every vertex of the convex set of feasible solution is a _____

   d) When total demand is equal to total supply, the transportation problem is said to be _____ **(W. 1)**

Answer **any 6** from the following. **(Weightage 1 each)**

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

3. For a L.P.P. Define

   i) Objective function ii) Feasible solution.

4. Write the condition for optimality in simplex method.

5. Define the term "loop" associated with a Transportation problem.

6. Mathematically formulate the Assignment Problem.

7. Why the optimal solution of the Travelling salesman problem remains independent ?

8. Explain the Minimax criterion in game theory.

9. Explain the term "Mixed strategy" in game theory.

10. State whether the following matrix has a saddle point $\begin{bmatrix} 1 & 0 \\ -4 & 3 \end{bmatrix}$ **(W. 6×1=6)**

P.T.O.

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

11. 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.
12. Compare the canonical and standard forms of an LPP.
13. Using graphical method solve

    Maximise $Z = 8x_1 + 6x_2$

    Subject to

    $4x_1 + 2x_2 \leq 60$

    $2x_1 + 4x_2 \leq 48$

    $x_1 \geq 0, x_2 \geq 0$

14. Explain the different steps involved in simplex algorithm.
15. Write down the dual of the following problem

    Max : $Z = 4x_1 + 2x_2$

    Subject to

    $-x_1 - x_2 \leq -3$

    $-x_1 + x_2 \geq -2$

    $x_1, x_2 \geq 0$

16. Find the initial feasible solution to the following transportation problem by lowest cost entry method.

	W_1	W_2	W_3	
F_1	2	7	4	5
F_2	3	3	1	8
F_3	5	4	7	7
F_4	1	6	2	14
	7	9	18	

17. Solve the following minimal assignment problem

		Man			
		1	2	3	4
Job	I	12	30	21	15
	II	18	33	9	31
	III	44	25	24	21
	IV	23	30	28	14

18. Write explanatory note on the North - West corner method.

19. In a factory there are five jobs to perform each of which should go through to machines A and B in the order AB. The processing times for the jobs are given here. Find a sequence that will minimise the total time required in performing the following jobs on the machines

Job (i)	:	1	2	3	4	5
Machine A (Ai)	:	5	1	9	3	10
Machine B (Bi)	:	2	6	7	8	4

20. From the following game matrix, find the saddle point and state the game value

$$\text{Player X} \begin{matrix} P \\ Q \end{matrix} \begin{matrix} \text{Player Y} \\ M \quad N \end{matrix} \begin{bmatrix} 6 & 2 \\ -1 & -4 \end{bmatrix}$$

(W. 7×2=14)

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

21. Solve the following using simplex method

Maximise $Z = 6x_1 + 4x_2$

Subject to $-2x_1 + x_2 \leq 2$

$x_1 - x_2 \leq 2$

$3x_1 + 2x_2 \leq 9$

$x_1, x_2 \geq 0.$

22. Apply the principle of duality to solve the LPP

Min $Z = 2x_1 + 2x_2$

Subject to

$2x_1 + 4x_2 \geq 1$

$x_1 + 2x_2 \geq 1$

$2x_1 + x_2 \geq 1$

$x_1, x_2 \geq 0.$

23. Solve the following transportation problem whose cost matrix are given below (By Vogel's approximation method)

WAREHOUSE

Plant	W_1	W_2	W_3	W_4	Availability
P_1	190	300	500	100	70
P_2	700	300	400	600	90
P_3	400	100	600	200	180
Requirement	50	80	70	140	

24. Use graphical method to minimise the time added to process the following jobs on the machine shown i.e, for each machine find the job which should be done first. Also calculate the total time elapsed to complete both 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

25. Solve the following 2×2 game graphically

Player B

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

(W. 3×3=9)