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D3BEM2103 (PAGES 2) Reg.No............................

Name: ....

THIRD SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2022

(Regular/Improvement/Supplementary)

ECONOMICS & MATHEMATICS (DOUBLE MAIN)

GDEC3B03T: LINEAR PROGRAMMING AND PROBABILITY

Time: 2 ½ Hours **Maximum Marks: 80**

SECTION A: Answer the following questions. Each carries *two* marks. (Ceiling 25 Marks)

1. Define convex set. Give one example.
2. Give two examples for convex polyhedron.
3. Write any two characteristics of canonical form of LPP.
4. Rewrite in standard form the following LPP :

   Minimize $z = 2x_1+x_2+4x_3$

   Subject to the constraints

   $-2x_1 + 4x_2 \leq 4$

   $x_1 + 2x_2 + x_3 \geq 5$

   $2x_1 + 3x_3 \leq 2$

   $x_1, x_2, x_3 \geq 0$
5. State the weak duality theorem.
6. Obtain the dual of the following LPP :

   Maximize $z = 2x_1-9x_2+x_3$

   Subject to the constraints

   $-3x_1 + 6x_2 - x_3 \geq 4$

   $2x_1 + x_2 + x_3 \leq 1$

   $x_1 + 7x_2 + 5x_3 \leq 2$

   $x_1, x_2, x_3 \geq 0$
7. What are the changes which are usually studied by post optimality analysis?
8. Define net evaluation for a linear programming problem.
9. State a balanced transportation problem as a linear programming problem.
10. Define a loop in a transportation table.
11. Distinguish between pure strategy and mixed strategy.
12. What do you mean by a saddle point of a game?
13. Define conditional probability.
14. Given $p(A) = 0.30$, $p(B) = 0.78$, and $p(A \cap B) = 0.16$. Find $p(A^c \cap B^c)$
15. Define independent events.

SECTION B: Answer the following questions. Each carries *five* marks. (Ceiling 35 Marks)

16. Prove that any convex linear combination of k different optimum solutions to an LPP is again an optimal solution to the problem.
17. "An animal feed company must produce 200 grams of a mixture containing the ingredients X and Y. X costs Rs.3 per gram and Y costs Rs.8 per gram. Not more than 80 grams of X can be used and minimum quantity to be used for Y is 60 grams. Find how much of each ingredient should be used if the company wants to minimize the cost ." Formulate mathematically.

(PTO)

18. What is the role of artificial variables in the solution of LPP using simplex method?
19. Write the steps in cutting plane method to solve an AIPP.
20. Obtain an initial basic feasible solution to the following transportation problem using matrix minima method.

	D1	D2	D3	D4	Capacity
O1	1	2	3	4	6
O2	4	3	2	0	8
O3	0	2	2	1	10
Demand	4	6	8	6	

21. Solve the following assignment problem :

	A	B	C	D
I	1	4	6	3
II	9	7	10	9
III	4	5	11	7
IV	8	7	8	5

22. If A and B are two independent events , prove that
    (i) A and B^c are independent.
    (ii) A^c and B^c are independent.
23. Define mutually exclusive events and equally likely events.

SECTION C: Answer any *two* questions. Each carries *ten* marks.

24. Solve the following LPP:

    Maximize $z = 6x_1+4x_2$

    Subject to the constraints

    $2x_1 + 3x_2 \leq 30$

    $3x_1 + 2x_2 \leq 24$

    $x_1 + x_2 \geq 3$

    $x_1, x_2 \geq 0$
25. Solve the following transportation problem :

	D1	D2	D3	Capacity
O1	50	30	220	1
O2	90	45	170	4
O3	250	200	50	4
Demand	4	2	3	

26. Solve the following 2 x 4 game graphically.

		Player B			
		B1	B2	B3	B4
Player A	A1	2	1	0	-2
	A2	1	0	3	2

27. State and prove Baye's theorem.

(2 × 10 = 20 Marks)