D3BEM2203 (PAGES 2) **Reg.No.....**

Name: .....

THIRD SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2023

(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 linear programming.
2. State any two advantages of LPP.
3. Define a Feasible solution.
4. State Duality theorem.
5. Define the optimal solution.
6. What exactly is sensitivity analysis in optimization?
7. What are the advantages of the branch and bound method?
8. What is the transportation problem? Mention its application.
9. What actually is a penalty in the VAM method?
10. What is an assignment problem?
11. Write an example of a zero-sum game.
12. State statistical definition of probability.
13. Write the multiplication theorem of three events.
14. Define Equally likely events.
15. Write the three Axioms of probability.

SECTION B: Answer the following questions. Each carries *five* marks.

(Ceiling 35 Marks)

16. Distinguish between Slack and surplus variables, and write an example.
17. What are the disadvantages of the BIG-M method over the two-phase method?
18. Write any two Advantages and Applications of Duality
19. How the cutting plane method works in solving the integer linear programming problem?
20. What is meant by an unbalanced assignment problem? How are they solved?
21. An animal feed company must produce at least 300kgs of a mixture consisting of ingredients X_1 and X_2 daily. X_1 costs Rs. 3.5 per kg and X_2 Rs. 9 per kg. No more than 70kg of X_1 can be used and at least 80kgs of X_2 must be used. Formulate a mathematical model for the problem.

(PTO)

22. Prove that mutual independence implies pairwise independence converse is not true.
23. Two hundred people were asked about which athletic event they thought was the most exciting to watch. The results are shown in the table below. A person is chosen at random. Given that that person chose 100m, what is the probability that the person was female?

	100m	Long jump	Javelin
Male	56	30	24
Female	32	29	29

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

24. Solve the LPP using the Simplex method
Maximize $Z = x_1 + 3x_2$
Subject to
$$x_1 \leq 5$$
$$x_1 + x_2 \leq 10$$
$$3x_2 \leq 4$$
$$x_1 \geq 0 \quad x_2 \geq 0$$
25. Solve using Simplex algorithm:
"A furniture factory owns two lumber operations. The first lumber operation produces 1/2 ton of usable walnut, 1 ton of usable oak, and 1 ton of usable pine per day. The second lumber operation produces 1 ton of usable walnut, 1 ton of usable oak, and 1/2 ton of usable pine per day. The factory requires at least 10 tons of walnut, 15 tons of oak and 10 tons of pine. If it costs $ 300 per day to run the first lumber operation and $ 350 per day to run the second lumber operation, how many days should each operation be run so as to minimize costs?"
26. Find an optimal solution for the given transportation problem. There are three origins and four destinations.

	Destination				Availability
Origin	6	1	9	3	70
	11	5	2	8	55
	10	12	4	7	90
Requirements	85	35	50	45	

27. A) Two dice are thrown together. What is the probability that the number obtained on one of the dice is multiple of number obtained on the other dice?
B) From a pack of cards, three cards are drawn at random. Find the probability that each card is from different suit.

(2 x 10 = 20 Marks)