Reg. No.													

B.Tech. DEGREE EXAMINATION, DECEMBER 2023
Second and Fourth Semester

21MAB301T – PROBABILITY AND STATISTICS
(For the candidates admitted from the academic year 2022-2023)

Note:

(i) **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.

(ii) **Part – B** and **Part – C** should be answered in answer booklet.

Time: 3 Hours

Max. Marks: 75

PART – A (20 × 1 = 20Marks)
Answer ALL Questions

		Marks	BL	CO	PO

1. Compute if a coin is tossed twice then the probability of getting at least one head is — Marks 1, BL 1, CO 1
   (A) 1/2   (B) 1/4
   (C) 3/4   (D) 0.1

2. The first two moments about the origin are 5, 26 respectively, then find the value of the second moment about x=3 — Marks 1, BL 3, CO 1
   (A) 5   (B) 2/8
   (C) 0   (D) 2

3. Any subset of the sample space S is defined as — Marks 1, BL 1, CO 1
   (A) Trail   (B) Finite sample space
   (C) Event   (D) Experiment

4. If X is an random variable and V(X)=2 then calculate V(2X+3) is — Marks 1, BL 2, CO 1
   (A) 2   (B) 6
   (C) 8   (D) 3

5. The variance of the Poisson distribution is — Marks 1, BL 1, CO 2
   (A) λ (B) λ^2
   (C) $1/\lambda$ (D) $1/\lambda^2$

6. Let X be a uniformly distributed random variable over (0, 1) then the moment generating function is — Marks 1, BL 3, CO 2
   (A) $M_x(t) = \frac{1}{t}e^t - 1$ (B) $M_x(t) = \frac{1}{t}(e^t - 1)$
   (C) $M_x(t) = \frac{1}{t}$ (D) $M_x(t) = \frac{1}{t}(e^t + 1)$

7. The mean of a binomial distribution is 20 and the standard deviation is 4 then the parameters are — Marks 1, BL 3, CO 2
   (A) 60,5   (B) 100, 1/5
   (C) 50, 1/5   (D) 50, 2

8. A typist types 2 letters erroneously for every 100 letters then the probability   1 3 2
   that the tenth letter typed is the first letter with error is
   (A) 0.0153   (B) 0.0167
   (C) −0.033   (D) 0.662

9. The value set for α is known as   1 1 3
   (A) The level of rejection   (B) The level of acceptance
   (C) The level of significance   (D) Error

10. Consider a hypothesis where $H_0 : \phi_0 = 23$ against $H_1 : \phi_1 < 23$ then this test   1 2 3
    is
    (A) Right tailed   (B) Left tailed
    (C) Center tailed   (D) Cross tailed

11. For an m×n contingency table, the number of degrees of freedom equals   1 1 3
    (A) mn   (B) m+n
    (C) (m+1) (n−1)   (D) (m−1) (n−1)

12. The goodness of fit of a distribution is tested by   1 1 3
    (A) t-test   (B) F-test
    (C) Chi-square test   (D) Z-test

13. If r= 0 the two variables X and Y are   1 1 4
    (A) Correlated   (B) Uncorrelated
    (C) 0 to 1   (D) −1 to +1

14. If the two lines of regression are $\dot{x}+2y-5=0$ and $2x+3y-8=0$ then   1 5 4
    evaluate the means of x and y
    (A) $\bar{x}=-3, \bar{y}=4$ (B) $\bar{x}=-3, \bar{y}=-4$
    (C) $\bar{x}=1, \bar{y}=2$ (D) $\bar{x}=3, \bar{y}=4$

15. In two-way classification, the data are classified according to _____   1 1 4
    different factor
    (A) Two   (B) One
    (C) Five   (D) Six

16. The error derivatives with SSE statistics measure distances are   1 1 4
    (A) Between the groups   (B) Within groups
    (C) Out of the groups   (D) Standard Deviation

17. Statistical quality control is a productivity-enhancing and regulatory   1 1 5
    technique with three factors management methods that are
    (A) Mathematics   (B) Chemistry
    (C) Physics   (D) Biology

18. The technique of control charts was pioneered by   1 1 5
    (A) Gosset   (B) Robert
    (C) W.A.Shewhart   (D) R.A. Fisher

19. In the control charts, UCL stands for   1   1   5
    (A) test control line   (B) Upper control limit
    (C) Lower control limit   (D) Upper control line

20. A typical control chart consists of _____ horizontal lines   1   1   5
    (A) One   (B) Two
    (C) Three   (D) Four

PART – B (4 × 10 = 40 Marks)   Marks   BL   CO
Answer ANY FOUR Questions

21. A company has two plants to manufacture scooters. Plant I manufactures   10   5   1
    80% of the scooter and Plant II manufactures 20%. At the Plant I, 85% of
    scooters are rated as standard quality. At plant II, only 65% of scooters are
    rated as standard quality. Then,

    (i) Find the probability, that a customer obtains a standard quality scooter if
    he buys a scooter from the company

    (ii) Find the probability, that the scooter came from plant I, plant II if it is
    known that the scooter is of standard quality.

22. A random variable X has the following probability function.   10   5   1

Value of x	0	1	2	3	4	5	6	7
P(X=x)	0	k	2k	2k	3k	K^2	$2k^2$	$7k^2+k$

    Then find (i) the value of k, (ii) P(X<6) and mean (iii) find the cdf of X.

23. In an engineering examination, if a student gets 30 or more marks he will   10   5   2
    pass. If he secures 60% or more marks he will get first class. If he secures
    between 45% and 60% gets second class and between 30% and 45 %, he will
    get third class. He will get a distinction if he gets more than 80% marks. It
    was found that 10% failed, and 5% obtained distinction. Calculate the
    percentage of students placed in second class.

24.i. A machinist is expected to make engine parts with an axle diameter of 1.75   10   5   3
    cm. A random sample of 10 parts shows a mean diameter of 1.85 cm, with
    an SD of 0.1 cm. On the basis of this sample, would you say that the work
    of the machinist is inferior at a 5% level of significance?

   ii. In a random sample of size 500, the mean is found to be 20. In another
    independent sample of size 400, the mean is 15. Calculate the samples that
    have been drawn from the same population with a standard deviation of 4 at
    1% level of significance.

25. Compute the Spearman's rank correlation coefficient from the following   10   5   4
    data:

x:	68	66	68	65	69	66	68	64	71	67	68	70
y:	65	63	67	64	68	62	70	66	66	67	69	71

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26. Given below are the values of sample means and sample range for ten samples, each of size 5. Construct the control chart for mean and range and comment on the nature of control.

Sample no:	1	2	3	4	5	6	7	8	9	10
Mean $\overline{X}$	43	49	37	44	45	37	51	46	43	47
Range R	5	6	5	7	7	4	8	6	4	6

PART – C (1 × 15 = 15 Marks)
Answer ANY ONE Questions

27. Two random samples gave the following data.

Sample	Size	Mean	Variance
1	8	9.6	1.2
2	11	16.5	2.5

Calculate that the two samples have been drawn from the same normal population.

28. In order to determine whether there is significant difference in the durability of 3 makes of computers, samples of size 5 are selected from each make and the frequency of repair during the first year of purchase is observed. The results are as follows.

Makes		
A	B	C
5	8	7
6	10	3
8	11	5
9	12	4
7	4	1

Determine the analysis of variance.

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