Reg. No.															

Question Paper Code	12550

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2023

First Semester

Computer Science and Business Systems

20BSMA103 - INTRODUCTORY TOPICS IN STATISTICS, PROBABILITY AND CALCULUS

(Use of Statistics table is permitted)

(Regulations 2020)

Duration: 3 Hours Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

		Marks, K-Level, CO
1.	Find $x \xrightarrow{limit} 3 \frac{x^2-9}{x-3}$.	*2,K2,CO1*
2.	Find $\frac{dy}{dx}$ if $xy = c^2$.	*2,K2,CO1*
3.	Find $\int e^{x^3} x^2 dx$.	*2,K2,CO2*
4.	Evaluate $\int_0^a \int_0^b \int_0^c xyzdzdydx$.	*2,K2,CO2*
5.	One card is drawn at random from 52 cards. What is the chance of getting a king or a queen?	*2,K2,CO3*
6.	Find the MGF of the random variable X having pdf $f(x) = \frac{1}{4}$; -2 ≤ x ≤ 2.	*2,K2,CO3*
7.	If Var(X) = 3, Var(Y) = 4, then find Var (3X + 4Y).	*2,K2,CO4*
8.	If X is uniformly distributed over $(0,10)$, find $P(X < 4)$.	*2,K2,CO4*
9.	What are the various measures of dispersion?	*2,K2,CO5*
10.	Find the range and coefficient of range of the weights of 10 students from the following data: 41,20,15,65,73,84,53,35,71,55.	*2,K2,CO5*

PART - B (5 × 16 = 80 Marks)

Answer ALL Questions

11. a) (i) Find $\frac{dy}{dx}$, if $y = \sqrt{sinx + \sqrt{sinx + \sqrt{sinx + \cdots}}}$ *8,K3,CO1*

(ii) If $f(x) = \begin{cases} \frac{x^2-4}{x-2}, x < 2 \\ ax^2 - bx + 3, 2 \le x < 3 \\ 2x - a + b, x \ge 3 \end{cases}$ is continuous for all real x, find the values of a and b. *8,K3,CO1*

OR

b) For the function $f(x) = 2x^3 + 3x^2 - 36x + 5$, find *16,K3,CO1*

(i) The interval where the function is increasing or decreasing.

(ii) The Local maxima and local minima using first derivative test.
(iii) The intervals where the function concave upward or downward.
(iv) The points of inflection

12. a) (i) Find $\int_0^{\frac{\pi}{2}} \frac{\sqrt{sinx}}{\sqrt{sinx}+\sqrt{cosx}} dx$. *8,K3,CO2*

(ii) Find the area enclosed by the parabola $y^2 = 4ax$ and $x^2 = 4ay$. *8,K3,CO2*

OR

b) Find the volume of the sphere using triple integration $x^2 + y^2 + z^2 = a^2$. *16,K3,CO2*

13. a) (i) A continuous random variable x has probability density function $f(x) = kx^2e^{-x}$, find k, mean and variance. *10,K3,CO3*

(ii) Find the mean and variance of the distribution whose MGF is $(0.4e^t + 0.6)^2$. *6,K3,CO3*

OR

b) A factory has two machines I and II. Machine I and II produce 30% and 70% of items respectively. Further 3% of items produced by Machine I are defective and 4% of items produced by Machine II are defective. An item is drawn at random. If the drawn item is defective, find the probability that it was produced by Machine I & II. *16,K3,CO3*

14. a) (i) The number of monthly breakdowns of a computer is a random variable having a Poisson distribution with mean equal to 1.8. Find the probability that this computer will function for a month (1) without a breakdown (2) with only one breakdown. *8,K3,CO4*

(ii) A random variable X has the following probability distribution *8,K3,CO4*

x	0	1	2	3	4	5	6	7	8
P(x)	a	3a	5a	7a	9a	11a	13a	15a	17a

Find a) the value of a b) The distribution function of x.

OR

b) (i) State and prove memory less property of Exponential distribution. *8,K3,CO4*

(ii) The weights of parcels that are dropped off at a local shipping center can be represented by a random variable X that is normally distributed with mean 70 and S.D 10. Determine the following : *8,K3,CO4*
(1) P(x) >50 (2) P(x) < 60 (3) P (60 < X < 90).

15. a) (i) Find the quartile deviation and coefficient of quartile deviation from the following. *8,K3,CO5*

Wages	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
No of Workers	20	45	85	160	70	55	35	30

(ii) The following figures relate to the cost of construction of a house in Delhi. Represent the data by a suitable diagram. *8,K3,CO5*

Item	Cement	Steel	Bricks	Timber	Labour	Miscellaneous
Expenditure	20%	18%	10%	15%	25%	12%

OR

b) (i) Compute Q_3 and D_7 for the following frequency distribution: *8,K3,CO5*

Marks	No of students	Marks	No of students
0-10	3	40-50	6
10-20	10	50-60	4
20-30	17	60-70	2
30-40	7	70-80	1

(ii) Calculate the mean, median and mode for the following data. *8,K3,CO5*

Marks	0-10	10-20	20-30	30-40	40-50	50-60
No of students	2	6	9	7	4	2