Reg. No.																

Question Paper Code	12983

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2024

First Semester

Computer Science and Business Systems

20BSMA103 - INTRODUCTORY TOPICS IN STATISTICS, PROBABILITY AND CALCULUS

Regulations - 2020

(Use of Statistical table is permitted)

Duration: 3 Hours Max. Marks: 100

PART - A (MCQ) (20 × 1 = 20 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	An _____ function is one which is given in terms of the independent variable. (a) Explicit (b) Implicit (c) Onto (d) One-to-One	1	K1	CO1
2.	If $f(-x) = f(x)$ for every element x in its domain, then the function is said to be (a) Odd function (b) Composite function (c) Even function (d) Prime function	1	K1	CO1
3.	The domain of the function $f(x) = \frac{x}{\lvert x \rvert}$ is_____. (a) $(-\infty, 0) \cup (0, \infty)$ (b) $(-\infty, 0)$ (c) $(0, \infty)$ (d) $(-\infty, 0) \cap (0, \infty)$	1	K2	CO1
4.	If f(x) changes from positive to negative then f(x) has a _____ value. (a) constant (b) minimum (c) zero (d) maximum	1	K1	CO1
5.	Integration is the _____ process of differentiation. (a) same (b) parallel (c) different (d) inverse	1	K1	CO2
6.	$\int f(x)dx$ is called as _____. (a) function of integral (b) indefinite integral (c) function (d) definite integral	1	K1	CO2
7.	The value of $\int_0^{\frac{\pi}{2}} sin^6 x\, dx =$ _____ (a) $\frac{5\pi}{32}$ (b) $\frac{3\pi}{16}$ (c) $\frac{\pi}{4}$ (d) 0	1	K2	CO2
8.	The formula for integration by parts is (a) $\int f(x)g'(x)dx = f(x)g(x)$ (b) $\int f(x)g'(x)dx = f(x) - \int g(x)f'(x)dx$ (c) $\int f(x)g'(x)dx = \int g(x)f'(x)dx$ (d) $\int f(x)g'(x)dx = f(x)g(x) - \int g(x)f'(x)dx$	1	K1	CO2
9.	If a fair coin is tossed, what is the probability of getting heads? (a) 0 (b) 1/2 (c) 1 (d) 1/3	1	K1	CO3
10.	If a die is rolled, what is the probability of rolling a number less than 4? (a) 0.5 (b) 0.6 (c) 0.10 (d) 0.11	1	K2	CO3
11.	What is the formula for Bayes' Theorem? (a) $P(A \mid B) = \frac{P(B \mid A).P(A)}{P(B)}$ (b) $P(A \mid B) = \frac{P(A \mid B).P(B)}{P(A)}$ (c) $P(B) = \frac{P(A).P(B)}{P(B \mid A)}$ (d) $P(A) = \frac{P(B).P(A)}{P(A \mid B)}$	1	K1	CO3
12.	What is the sample space for flipping a coin once? (a) Heads (b) Tails (c) Heads, Tails (d) None of the above	1	K1	CO3
13.	What are the parameters of a binomial distribution? (a) p and q (b) n and q (c) n and p (d) λ	1	K1	CO4

14. How is the variance of a discrete random variable calculated? *1 K1 CO4*

(a) $Var(X) = E(X^2) - [E(X)]^2$ (b) $Var(X) = E(X^2)$

(c) $Var(X) = [E(X)]^2$ (d) $Var(X) = E(X)^2 - [E(X^2)]$

15. In a Poisson distribution, what does the parameter λ represent? *1 K1 CO4*

(a) variance (b) mean (c) Both mean and the variance (d) constant

16. The Curve of the normal distribution is *1 K1 CO4*

(a) Bell shaped (b) Flat (c) Triangle (d) Square

17. What do you know by the term "population" in statistics? *1 K1 CO5*

(a) group of individuals (b) to the single person

(c) mean of the group (d) entire group of individuals

18. The first hand and unorganized form of data is _____. *1 K1 CO5*

(a) Primary data (b) Secondary data (c) Organized data (d) None of these

19. As one variable increases, the other also increases is _____ correlation. *1 K1 CO5*

(a) negative (b) positive (c) multi d) bilinear

20. Conditional frequency distributions are useful in *1 K1 CO5*

(a) Education (b) Marketing (c) Public health d) All the above

PART - B (10 × 2 = 20 Marks)

Answer ALL Questions

21. Find the critical points of the function $f(x) = 5x^3 - 6x$. *2 K2 CO1*

22. Discuss the continuity of the function f (x) = |x|. *2 K2 CO1*

23. Evaluate $\int_0^2 \int_0^y \int_0^x dxdydz$. *2 K2 CO2*

24. Find $\int e^{cosx} sinx\ dx$. *2 K2 CO2*

25. What is conditional probability? *2 K1 CO3*

26. If a random variable X takes the values 1, 2, 3, 4, such that $2P(X = 1) = 3P(X = 2) = P(X = 3) = 5P(X = 4)$. Find the probability distribution of X. *2 K2 CO3*

27. If X is a normal random variable with mean 3 and variance 9, find the probability that X in between 2 and 5. *2 K2 CO4*

28. State any two properties of Normal distribution. *2 K2 CO4*

29. What are the measures of central tendency? *2 K1 CO5*

30. Draw a frequency curve for the following distribution: *2 K2 CO5*

Age (Yrs.)	17-19	19-21	21-23	23-25	25-27	27-29	29-31
No. of Students	7	13	24	30	22	15	6

PART - C (6 × 10 = 60 Marks)

Answer ALL Questions

31. a) 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. *10 K3 CO1*

OR

b) For the function $f(x) = 2 + 2x^2 - x^4$ find the intervals of increase or decrease, local maxima and minima values, intervals of concavity and inflection points *10 K3 CO1*

32. a) Evaluate $\iiint_V \frac{dzdydx}{(x+y+z+1)^3}$ over the region of integration bounded by the planes $x = 0, y = 0, z = 0, x + y + z = 1$. *10 K3 CO2*

OR

b) Find the area of ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ using double integration. *10 K3 CO2*

33. a) A random variable has the following probability distribution. *10 K3 CO3*

X	-2	-1	0	1	2	3
P (X)	0.1	K	0.2	2k	0.3	3k

Find (i) the value of k (ii) Evaluate $P(-2 < X < 3)$ (iii) The cumulative distribution of X (iv) the mean of X (v) the variance of X.

OR

b) In a bolt factory machines A, B, and C produce 25%, 35%, 40% of the total output respectively. Of their outputs 5%, 4%, 2% are defective bolts. If a bolt is chosen at random from the combined output, what is the probability that it is defective? If a bolt chosen at random is defective, what is the probability that was produced by B? *10 K3 CO3*

34. a) Messages arrive at a switch board in a Poisson manner at an average rate of six per hour. Find the probability for each of the following events (i) Exactly two messages arrive within one-hour (ii) no message arrive within one hour (iii) at least three messages arrive within one hour. *10 K3 CO4*

OR

b) The life of a certain kind of electronic device has a mean of 300 hours and standard deviation of 25 hours. Assuming that the life times of the devices follow normal distribution. (i) Find the probability that any of these devices will have a life time more than 350 hours. (ii) What percentage will have life time between 220 and 260 hours? *10 K3 CO4*

35. a) Calculate the Quartile deviation, Mean deviation and their co-efficient. *10 K3 CO5*

Height(x)	58	59	60	61	62	63	64	65
F	10	18	30	42	35	28	16	8

OR

b) Calculate the mean, median and mode for the following data. *10 K3 CO5*

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

36. a) i) The annual rainfall in inches in a certain region has a normal distribution with a mean of 40 and variance of 16. What is the probability that the rainfall in a given year is between 30 and 48 inches? *5 K3 CO4*

ii) Construct frequency table for the following data: *5 K3 CO5*
2, 3, 1, 12, 20, 21, 32, 32, 21, 6, 7, 8.

OR

b) i) Let X be uniformly distributed random variable in the interval (a, 9) and $P(3 < x < 5) = \frac{2}{7}$. *5 K3 CO4*

Find the constant 'a'.

ii) The following table gives the distribution of monthly income of 600 families in a certain city. *5 K3 CO5*

Monthly Income (in Rs.)	Below 75	75-150	150-225	225-300	300-375	375-450	450 and over
No. of families	60	170	200	60	50	40	20

Draw a less than o give curve for the above data on the same graph and from these read the median income.