

Reg. No.

Question Paper Code

12125

08 AUG 2023

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2023

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 (10 × 2 = 20 Marks)**

Answer ALL Questions

- |   | <i>Marks,<br/>K-Level, CO</i> |
|---|-------------------------------|
| 1. Find $\frac{dy}{dx}$ , if $y = xe^x$ .   | 2,K2,CO1                      |
| 2. Find the critical points of the function $f(x) = 5x^3 - 6x$ .  | 2,K2,CO1                      |
| 3. Find $\int \frac{\log x}{x} dx$ .  | 2,K2,CO2                      |
| 4. Find $\int_0^a \int_0^b \int_0^c xyz dz dy dx$ .   | 2,K2,CO2                      |
| 5. Two dice are thrown simultaneously. What is the probability of getting a doublet?                    | 2,K1,CO3                      |
| 6. If $X, Y$ are independent random variables and $Var(X) = 3, Var(Y) = 4$ , then find $Var(3X + 4Y)$ . | 2,K2,CO3                      |
| 7. If $n=5$ and $p=0.5$ , find the binomial distribution.   | 2,K2,CO4                      |
| 8. If $X$ is uniformly distributed over $(0,10)$ find $P(X < 4)$ .                                      | 2,K2,CO4                      |
| 9. Define Data.   | 2,K1,CO5                      |
| 10. What are merits of mode?  | 2,K1,CO5                      |

**PART - B (5 × 16 = 80 Marks)**

Answer ALL Questions

11. a) If  $f(x) = \begin{cases} \frac{x^3-8}{x-2}, & x < 2 \\ ax^2 - bx + 3, & 2 \leq x < 3 \\ 2x - a + b, & x \geq 3 \end{cases}$  is continuous for all real  $x$ , find the values of  $a$  and  $b$ . 16,K3,CO1
- OR**
- b) (i) Find  $\frac{dy}{dx}$ , if  $(\sin x)^{\cos y} = (\sin y)^{\cos x}$ . 8,K2,CO1  
(ii) Find the absolute maximum and minimum values of the function  $f(x) = 3x^4 - 16x^3 + 18x^2, -1 \leq x \leq 4$ . 8,K2,CO1
12. a) (i) Find the value of the integral  $\int_0^{\frac{\pi}{2}} \frac{\sqrt{\sin x}}{\sqrt{\sin x + \sqrt{\cos x}}} dx$ . 8,K2,CO2  
(ii) Find the area of ellipse using double integration. 8,K3,CO2

**OR**

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create

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b) Find the volume of the sphere using triple integration.

16,K3,CO2

13. a) A random variable  $X$  has the following probability function.

16,K3,CO3

$x$	0	1	2	3	4	5	6	7
$p(x)$	0	$k$	$2k$	$2k$	$3k$	$k^2$	$2k^2$	$7k^2 + k$

Find  $k$ ,  $P(X < 6)$ ,  $P(X \geq 6)$  and  $P(0 < X < 5)$ . Determine the distribution function of  $X$ .

OR

b) (i) 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 or C?

8,K3,CO3

(ii) Find the moment generating function of Poisson distribution.

8,K2,CO3

14. a) Out of 800 families with 4 children each, how many families would be expected to have (i) 2 boys and 2 girls (ii) atleast one boy (iii) at most 2 girls (iv) children of both sexes?

16,K3,CO4

OR

b) (i) The following data are got from an investigation:

8,K3,CO4

Sample	Size	Mean	Standard Deviation
1	16	23.4	2.5
2	12	24.9	2.8

Is the difference between the means significant?

(ii) In an experiment on immunization of cattle from tuberculosis the following results were obtained.

8,K3,CO4

	Affected	Not affected
Inoculated	12	26
Not-inoculated	16	6

Calculate  $\chi^2$  and discuss the effect of vaccine in controlling susceptibility to tuberculosis.

15. a) (i) Draw a Pie diagram to represent the following data on the proposed outlay during the Seventh Five-Year plan.

8,K3,CO5

Item	Agriculture	Industries and Minerals	Irrigation and Power	Communication	Others
Rs (in crores)	6,000	4,000	2,500	4,500	3,000

(ii) Find the standard deviation and coefficient of variation from the following data:

8,K3,CO5

Size of the item	10	11	12	13	14	15	16
Frequency	2	7	11	15	10	4	1

OR

b) Plot less than Ogive and more than Ogive curve for the following data.

16,K3,CO5

Cost of Production	4-6	6-8	8-10	10-12	12-14	14-16
No of items	13	111	182	105	19	7