

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV/DEC 2022 (MARCH 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,</i><br><i>K-Level, CO</i> |
|--|-------------------------------------|
| 1. Find $\lim_{x \rightarrow 3} \frac{x^2 - 9}{x - 3}$ .                             | 2, K3, CO1                          |
| 2. Find $\frac{dy}{dx}$ , if $y = xe^x$ .  | 2, K3, CO1                          |
| 3. Find $\int e^{x^3} x^2 dx$ .  | 2, K3, CO2                          |
| 4. Find $\int_0^1 \int_0^2 xy^2 dx dy$ .   | 2, K3, CO2                          |
| 5. If $\text{Var}(X) = 3$ , $\text{Var}(Y) = 4$ , then find $\text{Var}(3X + 4Y)$ .  | 2, K3, CO3                          |
| 6. Two dice are thrown simultaneously. What is the probability of getting a doublet? | 2, K3, CO3                          |
| 7. If $n = 5$ and $p = 0.5$ , find the pmf of binomial distribution.                 | 2, K3, CO4                          |
| 8. If $X$ is uniformly distributed over $(0, 10)$ , find $P(X < 4)$ .                | 2, K3, CO4                          |
| 9. Define data.  | 2, K1, CO5                          |
| 10. Draw a line diagram for the following data:                                      | 2, K2, CO5                          |

X	1	2	3	4	5	6	7	8
Y	2	18	15	10	13	22	9	11

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 the absolute maximum and minimum values of the function 8, K3, CO1  
 $f(x) = 3x^4 - 16x^3 + 18x^2, -1 \leq x \leq 4$ .
- (ii) Find the local maximum and local minimum of the function 8, K3, CO1  
 $f(x) = x^4 - 2x^2 + 3$ .

12. a) (i) Evaluate  $\int_0^{\frac{\pi}{2}} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}} dx$ . 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. 16,K3,CO2

- 13 a) 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 A, B or C? 16,K3,CO3

OR

- b) (i) A continuous random variable  $X$  has pdf  $f(x) = kx^2e^{-x}, x \geq 0$ . Find  $k$ , mean and variance. 8,K3,CO3

- (ii) A random variable has the following probability function 8,K3,CO3

$x$	0	1	2	3	4
$P(x)$	$k$	$3k$	$5k$	$7k$	$9k$

Find the value of  $k$ ,  $P(X < 3)$  and  $P(0 < X < 4)$ .

14. a) Out of 800 families with 4 children each, how many families would be expected to have (1) 2 boys and 2 girls (2) atleast one boy (3) at most 2 girls (4) children of both sexes? 16,K3,CO4

OR

- b) (i) Two independent samples of 8 and 7 items had the following values. 8,K3,CO4

Sample I	9	11	13	11	15	9	12	14
Sample II	10	12	10	14	9	8	10	

Do the two estimates of the population variances differ significantly at 5% level of significant?

- (ii) 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?

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 & Minerals	Irrigation & Power	Communication	Miscellaneous
Rs(crores)	6,000	4,000	2,500	4,500	3,000

- (ii) Plot less than Ogive and more than Ogive curve for the following data 8,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

**OR**

- b) Find the standard deviation and coefficient of variation from the following data: 16,K3,CO5

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