

OSMANIA UNIVERSITY  
FACULTY OF ENGINEERING  
UNIVERSITY COLLEGE OF ENGINEERING (AUTONOMOUS)  
B.E. (CSE & AI&ML) III-Semester (Main) Examinations January/February 2023  
**MATHEMATICS-III (PROBABILITY & STATISTICS)**

Time: 3 hours

Max. Marks: 70

- Note: i) Answer **Question No. 1** (Compulsory) and Answer any **four** questions from the remaining questions (2- 7).  
ii) Answers must be written in same order as they occur in the Question Paper.  
iii) Missing data, if any, may suitably be assumed.

	Marks	BT	CO
1. a) Write the first 10 Prime numbers and find their Median.	2	4	1
b) Find the Mean and Variance in Exponential Distribution.	2	2	2
c) If X is a Binomial Distribution Random Variable with $E(X) = 2$ and $Var(X) = \frac{4}{3}$ then find the Distribution of X.	2	3	3
d) Given $n = 10, \sigma_x = 4.5, \sigma_y = 3.6$ and sum of the Product of deviation from the mean of $x$ and $y$ is 64. Find the Correlation Coefficient.	2	1	4
e) Write any two applications of the variance Ratio test (or) (F-test).	2	4	5
f) Two discrete Random Variables X and Y have ; $P(X = 0, Y = 1) = 2/9$ ; $P(X = 0, Y = 1) = 1/9$ ;  $P(X = 1, Y = 0) = 1/9$ ; $P(X = 1, Y = 1) = 5/9$ Test Whether X and Y are independent.	2	5	1
g) Telephone calls arrive at a college switch-board at a mean rate of $2/3$ call per minute according to a Poisson process. Let X denote the waiting time until the tenth call arrives by follows Gamma distribution.  i) What is the P.D.F of X?  ii) What is the M.G.F and then find mean and variance of X?	2	6	2
2. a) The values of $\mu_1, \mu_2, \mu_3$ , and $\mu_4$ are 0, 9.2, 3.6, and 1.22 respectively. Find out the skewness and Kurtosis of the distribution.	4	4	1
b) Find the mean and variance of the uniform Probability distribution given by $f(x) = \frac{1}{n}$ for $x = 1, 2, 3, \dots, n$	3	3	1
3. a) For the continuous probability function $f(x) = k x^2 e^{-x}$ when $x \geq 0$ , find i) k ii) Mean iii) Variance	7	4	2

- b) If a random variable  $X$  has the gamma distribution with  $r = 2$  and  $\lambda = \frac{1}{2}$  find (a) the mean (b) S. D (c) the probability that  $X$  will take a value less than 4.

7 3 2

4. a) Four coins are tossed 160 times. The number of times  $x$  heads occur is given below.

7 5 3

$x$	0	1	2	3	4
No. of times	8	34	69	43	6

Fit a binomial distribution to this data on the hypothesis that coins are unbiased

- b) For a normally distributed variety with mean 1 and standard deviation 3, find the probabilities that

7 5 3

(i)  $3.43 \leq x \leq 6.19$

(ii)  $-1.43 \leq x \leq 6.19$

5. a) Calculate the coefficient of correlation from the following data

7 6 4

$x :$	1	2	3	4	5	6	7	8	9
$y :$	9	8	10	12	11	13	14	16	15

Also obtain the equations of the lines of regression and obtain an estimate of  $y$  which should correspond on the average to  $X = 6.2$

- b) The ranks in two subjects are given below. Find the rank correlation coefficient

7 4 4

Rank in $x :$	5	2	8	1	4	6	3	7
Rank in $y :$	4	5	7	3	2	8	1	6

6. a) Explain Chi-Square distribution, its properties and applications.

7 3 5

- b) Explain student  $t$  - distribution, its properties and applications.

7 4 5

7. a) The equation of two regression lines are  $7x - 16y + 9 = 0$  and  $5y - 4x - 3 = 0$ . Find the coefficient of correlation and the means of  $x$  and  $y$ .

7 5 4

- b) The joint density function of two continuous random variable  $X$  and  $Y$  is

7 6 1

$$f(x, y) = \begin{cases} cxy, & 0 < x < 4, \quad 1 < y < 5 \\ 0, & \text{otherwise} \end{cases}$$

Find (i)  $c$  (ii)  $P(1 < x < 2, 2 < y < 3)$  (iii)  $P(X \geq 3, Y \leq 2)$

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