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**SUBJECT CODE NO: - Y-2214**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.Sc. (PATTERN-2013) T.Y. (SEM VI)**  
**Examination April / May - 2024**  
**Mathematics 1) Mathematical Statistics-II - MAT -603**

[Time: 1:30 Hours]

[Max. Marks: 50]

Please check whether you have got the right question paper.

N. B

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.

Q1 a) Attempt any one

08

1. Define mathematical expectations. Show that the mathematical expectation of the sum of two random variables is equal to the sum of their individual expectations.
2. Define covariance. Show that  

$$\text{Cov}(X + a, Y + b) = \text{Cov}(X, Y),$$
 where a, b are any constants.



b) Attempt any one:

07

1. From the given following table

$X = x$	-3	-2	-1	0	1	2	3
$P(x)$	0.05	0.10	0.30	0.00	0.30	0.15	0.10

Compute

- $\alpha$ )  $E(X)$  and  $E(X^2)$ ,
- $\beta$ ) variance of  $X$ .

2. Find the probability of getting at least six heads when eight coins are thrown simultaneously.

Q2 a) Attempt any one:

08

1. Define Poisson distribution. Give five examples of the occurrence of Poisson distribution in different fields.
2. Find the moment generating function of normal distribution.

b) Attempt any one:

07

1. In a Poisson frequency distribution, frequency corresponding to three successes is  $\frac{2}{3}$  times frequency corresponding to four successes. Find the mean and standard deviation of the distribution.

2. If  $X$  and  $Y$  are random variables and  $a, b, c, d$  are any numbers provided only that  $a \neq 0$  and  $c \neq 0$ , then prove that

$$r(aX + b, cY + d) = \frac{ac}{|ac|} r(X, Y)$$

**Q3** a) Attempt any one: 05

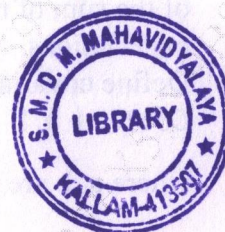
1. Find the mean of rectangular distribution over an interval  $(a, b)$ .
2. Prove that the moment generating function of the sum of a number of independent random variables is equal to the product of their respective moment generating function.

b) Attempt any one: 05

1. If the mean and variance of binomial distribution are 8 and 6 respectively. Find the number of trials.
2. If the random variance  $X$  with probability density function

$$f(x) = \begin{cases} \frac{2}{x^3}, & \text{if } x \geq 1, \\ 0 & \text{if } x < 1, \end{cases}$$

Then find  $E(X)$



**Q4** Choose the correct alternative and rewrite the sentence: 10

1. If  $X$  and  $Y$  are independent random variables with means 10 and 20 respectively and variance 2 and 3 respectively, the value of  $\text{Var}(3X + 4Y)$  is  
a. 64      b. 65      c. 66      d. 70
2. If  $M_x(t)$  be the moment generating function of a random variable  $X$ , then the function  $K_x(t) = \log_e M_x(t)$ , is known as \_\_\_\_\_  
a. Characteristic function  
b. Cumulant generating function  
c. Probability generating function  
d. Moment generating function
3. Variance of rectangular distribution in closed interval  $[2, 4]$  is  
a. 0      b.  $\frac{1}{2}$       c.  $\frac{1}{3}$       d.  $\frac{1}{4}$
4. If  $P(X) = \frac{1}{20}$ ,  $X = 5$  then  $E(X)$  is equal to \_\_\_\_\_  
a. 0.25      b. 0.5      c. 0.75      d. 1
5. If the coefficient of correlation  $r_{xy} = 0$ , then variables  $X$  and  $Y$  are \_\_\_\_\_  
a. Independent  
b. Uncorrelated  
c. No linear relation between them  
d. All of the above are true