QP Code: U25B033

Reg. No : .....

Name : .....

ST MARY'S COLLEGE (AUTONOMOUS), THRISSUR-20

II SEMESTER (FYUGP) DEGREE EXAMINATION, MARCH 2025

B.A./B.Sc./B.Com/BSW

STA2MN101 : PROBABILITY THEORY I

2024 Admission Onwards

(Credits: 4)

Time: 2 Hours **Maximum Marks: 70**

Section A

*Answer **all**. Each question carries **3** Marks* ***(Ceiling: 24 Marks)***

1. Obtain the probability distribution of number of heads in two tosses of a coin. [BTL1]
2. A small town experiences an average of 2 traffic accidents per week. Assuming a Poisson distribution, find the probability that in a given week, there will be no accidents. [BTL2]
3. Define moment generating function. Write any two properties. [BTL1]
4. Obtain the variance of rectangular distribution over the interval (2,6) [BTL3]
5. If Z follows standard normal distribution, find the probability that Z is greater than 0.85. [BTL2]
6. Verify whether the following function is a probability density function of a continuous random variable X [BTL2]
   $f(x) = 5x^2, 0 \leq x \leq 1$
   $= 0$ elsewhere
7. Draw a scatter diagram indicating perfect positive correlation [BTL2]
8. If 25X-6Y-7=0 is the regression line of X on Y. Identify the regression coefficient. [BTL3]
9. If X_1, X_2, X_3, X_4, X_5 are standard normal random variables, what is the distribution of $\sum_{i=1}^{5} X_i^2$? [BTL4]
10. What do you mean by statistic? [BTL1]

Section B

*Answer **all**. Each question carries **6** Marks* ***(Ceiling: 36 Marks)***

11. Given a discrete random variable X with probability distribution as [BTL3]

X	0	1	2	3	4
P(x)	0.2	k	2k	k/2	0.1

   i. Find the value of k
   ii. Find P(0.5≤X≤2.5)

Turn Over

12. The mean and variance of binomial variate X is 4 and 2 respectively. Find the probability of [BTL3]
    (i) less than two successes
    (ii) More than two successes
    (iii) At least two successes

13. What is the expectation of the number of failures preceding the first success in an infinite series of independent trials with constant probability p of success in each trial? [BTL4]

14. If X~N(25,3) and Y~N(20,4) and X and Y are independent, then find the distribution of X+Y. [BTL2]

15. The amount of bread X that a bakery can sell on a day has the probability density function, [BTL2]

$f(x) = Ax \quad 0 \le X \le 5$
$= A(10 - x) \quad 5 \le X \le 10$
$= 0$ otherwise

Find

i. A
ii. P (2.5 < X < 6.5)

16. Obtain the angle between the two lines of regression. [BTL2]

17. Show that coefficient of correlation is free from origin and scale of measurement. [BTL2]

18. If X_1, X_2 and X_3 are three independent N(0,1) random variables, what is the distribution of $\frac{(2X_1+2X_2+1X_3)^2}{9}$? [BTL5]

Section C

*Answer **any one**. Each question carries **10** Marks* ***(1x10=10 Marks)***

19. Show that there is a perfect correlation between the following X and Y series [BTL2]

X	10	12	14	16	18	20
Y	20	25	30	35	40	45

20. Given the pdf of X as [BTL5]

$f(x) = 2kx \quad 0 \le X \le 3$
$= k(-2x + 12) \quad 3 \le X < 6$
$= 0$ otherwise

Find (i) k (ii) P(2< X< 4) (iii) $P(X > 2|X<5)$

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