QP CODE: D2BST2404	(Pages: 2)	Reg. No : .....
		Name : .....

SECOND SEMESTER FYUGP EXAMINATION, APRIL 2025

MINOR COURSE

STA2MN101 : Probability Theory I

(Credits: 4)

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

Section A

Answer the following questions. Each carries 3 marks (Ceiling: 24 marks)

1.	Give the mean, variance and m.g.f. of a Poisson random variable.	BL2	CO3
2.	What is the condition for the existence of an m.g.f. for a random variable X?	BL2	CO2
3.	Define variance of a random variable.	BL2	CO1, CO2
4.	For $X \sim N(0,1)$, calculate the value of $M_X(0.5)$ using the m.g.f. formula.	BL2	CO3
5.	Define exponential distribution.	BL1	CO3
6.	If the coefficient of determination is 0.78, what is your interpretation?	BL2	CO4
7.	When would you choose curvilinear regression over linear regression?	BL2	CO4
8.	Can a χ^2 random variable take a negative value? Give reason.	BL2	CO5
9.	Distinguish between parameter and statistic.	BL2	CO5
10.	Suppose X and Y are independent $N(0,1)$ random variables, obtain the distribution of $\frac{X}{Y}$.	BL2	CO5

Section B

Answer the following questions. Each carries 6 marks (Ceiling: 36 Marks)

11.	Find expectation and variance for the following: x: 1 2 3 4 5 6 $P(x)$: 1/6 1/6 1/6 1/6 1/6 1/6	BL3	CO2
12.	With the usual notation find p for a binomial random variable if $n = 6$ and if $9P(X = 4) = P(X = 2)$.	BL3	CO3
13.	The following is a probability distribution. Find $P(X = -3)$ x: -1 -2 -3 -4 $P(x)$: 0.15 k $2k$ 0.25	BL3	CO2

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14.	Write down the p.d.f. of rectangular distribution over the interval $[-2, 3]$. Also give its mean, variance and m.g.f.	BL2	CO3
15.	Weight at birth of babies is a normal variate with mean 3.5 kgs. and standard deviation 0.9 kgs. Find the probability that a new born baby weighs less than 2kgs. What percentage of babies would you expect to weigh between 2.5 kgs. and 4.5 kgs.?	BL3	CO3
16.	Find the correlation coefficient between X and Y. X 1 2 4 5 8 9 Y 4 6 7 10 11 15	BL3	CO4
17.	Suppose X and Y are independent standard normal random variables, obtain the distribution of $\frac{X^2}{Y^2}$.	BL2	CO5
18.	A researcher collects a sample of size 36 from a population. The sample mean is 70 and the population standard deviation is 10. What is the probability that a sample mean of this size would be at least 68?	BL3	CO5
	Section C		
	Answer any one question. Each carries 10 marks (1 x 10 = 10 Marks)		
19.	Find k such that: $f(x) = \begin{cases} kx, & 0 \leq x < 5 \\ k(10-x), & 5 \leq x < 10 \end{cases}$ is a p.d.f.	BL3	CO2
20.	The equation of two regression lines in a correlation analysis are as follows $3x + 12y = 19$ and $3y + 9x = 46$. Obtain the mean value of x and y and the value of correlation coefficient.	BL3	CO4
	CO : Course Outcome		
	BL : Bloom's Taxonomy Levels (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)		