

Model Question Paper
Probability Distributions - Part V

12th Standard

Maths

Reg.No. :

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I. Answer All questions.

II. Use Blue pen Only.

Time : 01:00:00 Hrs

Total Marks : 70

5 x 1 = 5

Section-A

- 1) If in a Poisson distribution $P(X=0) = k$ then the variance is.
(a) $\log 1/k$ (b) $\log k$ (c) e^λ (d) $1/k$
- 2) If a random variable X follows Poisson distribution such that $E(X^2) = 30$ then the variance of the distribution is.
(a) 6 (b) 5 (c) 30 (d) 25
- 3) The distribution function $F(x)$ of a random variable X is.
(a) a decreasing function (b) a non-decreasing function (c) a constant function (d) increasing first and then decreasing
- 4) If X is a discrete random variable then which of the following is correct?
(a) $0 \leq F(x) < 1$ (b) $F(-\infty) = 0$ and $F(\infty) \leq 1$ (c) $P[X = X_n] = F(x_n) - F(x_n - 1)$ (d) $F(x)$ is a constant function
- 5) Which of the following are correct? i) $E(aX+b) = aE(X) + b$
ii) $\mu_2 = \mu_2' - (\mu_1')^2$
iii) $\mu_2 = \text{Variance}$
iv) $\text{var}(aX + b) = a^2 \text{var}(X)$
(a) all (b) (i), (ii), (iii) (c) (ii), (iii) (d) (i), (iv)

Section-B

4 x 3 = 12

- 6) If X is a normal variate with mean 80 and standard deviation 10, compute the following probabilities by standardizing. $P(85 \leq X \leq 95)$
- 7) Let Z be a standard normal variate. Calculate the following probabilities. Area to the right of $Z = 1.3$
- 8) For the probability density function, $f(x) = \begin{cases} 2e^{-2x}, & x > 0 \\ 0, & x \leq 0 \end{cases}$ find $F(2)$.
- 9) Let X have a Poisson distribution with mean 4. Find $P(2 \leq X < 5)$ [$e^{-4} = 0.0183$]

Section-C

4 x 6 = 24

- 10) A die is tossed twice. A success is getting an odd number on a toss. Find the mean and the variance of the probability distribution of the number of successes
- 11) Suppose that the probability of suffering a side effect from a certain vaccine is 0.005. If 1000 persons are inoculated. Find approximately the probability that (i) at most 1 person suffer. (ii) 4, 5 or 6 persons suffer. [$e^{-5} = 0.0067$]
- 12) If the height of 300 students are normally distributed with mean 64.5 inches and standard deviation 3.3 inches. Find the height below which 99% of the student lie.
- 13) If the probability density function of a random variable is given by $f(x) = \begin{cases} k(1-x^2), & 0 \leq x \leq 1 \\ 0, & \text{elsewhere} \end{cases}$ Find (i) k (ii) the distribution function of the random variable.

Section-D

2 x 10 = 20

- 14) The probability density function of a random variable X is $f(x) = \begin{cases} kx^{\alpha-1} e^{-\beta x^\alpha}, & x, \alpha, \beta > 0 \\ 0, & \text{elsewhere} \end{cases}$ (i) Find k (ii) Find $P(X > 10)$
- 15) If the number of incoming buses per minute at a bus terminus is a random variable having a Poisson distribution with $\lambda = 0.9$ find the probability that there will be (i) Exactly 9 incoming buses during a period of 5 minutes. (ii) Fewer than 10 incoming buses during a period of 8 minutes. (iii) At least 14 incoming buses during a period of 11 minutes.
