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FIRST YEAR (B.Sc. Data Science)
24DSC12105 Discrete & Continuous Probability Distributions
(Semester II)

Program: BSc (BSc DS10)
Program Specific: BSc (Data Science)
Course Type: Major
Paper: V

Credits: 2
Time: 2 Hours
Max. Marks: 30
SET: A

Instructions to the candidate:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Draw a well labelled diagram wherever necessary.
- 4) Use of Scientific calculator and statistical table is allowed.

Q1) Attempt ANY SIX of the following:

[6 X 2 = 12]

- a) Write any two real life situations where geometric distribution is applicable
- b) State the probability mass function (p.m.f.) of Negative binomial distribution (k, p).
- c) Identify the following distribution with parameters
$$f(x) = \frac{1}{2\sqrt{2\pi}} \exp\left\{-\frac{1}{8}(x^2 - 8x + 16)\right\}; -\infty < X < \infty.$$
- d) Let X follows B (n= 10, p = 0.3), Calculate mean and variance of X.
- e) If a random variable X is following χ_4^2 distribution then obtain mean and variance of X.
- f) State the additive property of chi square (χ^2) distribution.
- g) If $X \sim N(10, 25)$ and $Y \sim N(8, 36)$ with X and Y are independent random variables then state the distribution of $X + Y$ and its parameters.
- h) Define F distribution. State its mean if exist.

Q2) Attempt ANY THREE of the following:

[3 X 4 = 12]

- a) State any four properties of Normal Distribution.
- b) Identify the distribution whose p. m. f. is in following form

$$f(x) = \frac{1}{40}; x = 1, 2, 3, \dots, 40$$
$$= 0; \text{ Otherwise}$$

Hence, find E (X) and P(X=30)

- c) The number of spelling mistakes done in an hour by a DTP operator is a discrete random variable X which follows a Poisson distribution with parameter 3. Obtain the probability that on that day, in an hour, he commits,
 - I) exactly two spelling mistakes.
 - II) at least three spelling mistakes.

- d) The probability of successful rocket launching is 0.7. What is the probability that,
I) a successful launching will be made on the 4th attempt?
II) fewer than 4 attempts will be required to make a successful launching.
- e) Let X follows normal distribution with mean 2 and variance 16. Find
I) $P(X > 9)$
II) $P(-2 < X < 2)$

Q3) Attempt ANY TWO of the following:

[2 X 3 = 06]

- a) Let $X \sim U(a, b)$ distribution. If mean and variance of X are 5 and 3 respectively. Determine the values of a and b.
- b) The lifetime of a microprocessor is exponentially distributed with mean 3000 hours. Find the probability that
I) microprocessor fail within 300 hours
II) microprocessor will function for more than 650 hours.
- c) Let $X \sim B(n=10, p=0.86)$ distribution, find $P(X=4)$.
- d) I) State the lack of memory property of Geometric distribution.
II) For Geometric distribution with $p=0.4$ find $P(X > 2 | X > 1)$.
