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Reg. No. : ....

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III Semester B.A./B.Sc./B.Com./B.B.A./B.B.A.T.T.M./B.B.M./B.C.A./B.S.W./ B.A. Afsal Ul Ulama Degree (CCSS – Reg./Supple./Improv.) Examination, November 2012

COMPLEMENTARY COURSE IN - STATISTICS

(For Mathematics/Computer Science)

3C03STA : Standard Distributions

Time : 3 Hours Max. Weightage : 30

Instructions *: **Use** of calculate and statistical tables **permitted**.*

PART – A **(10×1=10)**

Answer **any 10** questions (weightage **1** each).

1. A random variable X has the following probability mass function.

   $P\left\{x = \frac{(-1)^k 2^k}{K}\right\} = \frac{1}{2^k}; K = 1, 2, 3,$

   Examine the existence of Ex.

2. A continuous random variable X has the density function

   $$f(x) = \begin{cases} 2(1-x) & \text{if } 0 < x < 1 \\ 0 & \text{otherwise} \end{cases}$$

   Find E $(3x^2 + 6x)$

3. Define the characteristics function of a random variable. State its important properties.

4. State and prove the addition theorem for the expectation of two random variables.

5. Two random variables X and Y have the following joint density functions

   $$f(x,y) = \begin{cases} 2 & \text{if } 0 < x < y < 1 \\ 0 & \text{otherwise} \end{cases}$$

   Find the conditional mean of x given y = y

6. Define geometric distribution. Derive its mean and variance.

P.T.O.

7. Find the moment generating function of exponential distribution.

8. Find the quartile deviation of normal distribution.

9. A random variable X has the following density function
$f(x) = 60x^2 (1 - x)^3 ; 0 < x < 1$
Find the mean and variance of x.

10. State the Bernoulli law of large numbers.

11. A random variable X has the density functions.

$$f(x) = \begin{cases} e^{-x} ; & x > 0 \\ 0 & \text{otherwise} \end{cases}$$

Show that the Chehychev's inequality gives.

$$P\{|x-|| > 2\} < \frac{1}{4}$$

PART – B (6x2=12)

Answer **any 6** questions (Weightage **2** each).

12. Show that the pearson's coefficient of correlation between two random variables is not affected by change of origin and scale.

13. A random variable X has the following density function.

$$f(x) = \frac{1}{2} e^{-|x|} ; -\infty < x < \infty$$

Find its moment generating function.

14. The probability distribution of a random variable X is given as follows :

X :	0	1	2	3
$p\{X = x\}$:	$\frac{1}{2}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{4}$

Find the first three central moments.

15. Derive the moment generating function of poisson distribution. Hence find its mean and variance.

16. Establish the 'lack of memory' property of geometric distribution.

17. Derive the expression for the even order central moments of normal distribution.

18. Define beta distribution of the second kind. Derive its variance.

19. State and prove Chehychev's inequality.

20. A balanced die is tossed 600 times. Find the lower bound for the probability of getting 80 to 120 sixes.

PART – C (2×4=8)

Answer **any 2** questions (Weightage **4** each).

21. Establish the following relationships
    i) $E[E(X/Y)] = EX$
    ii) $E[V(X/Y)] + V[E(X/Y)) = V(X]$
    iii) $[ExY]^2 \leq EX^2\, EY^2$

22. Derive the recurrence relation for the central moments of binomial distribution. Hence find its first three central moments.

23. Define one parameter gamma distribution. Derive its moment generating function and hence establish its additive property.

24. State and prove the weak law of large numbers (WLLN) of independent and identicall y distributed random variables. If $\{X_n\}$ is a sequence of independent random variables such that.

$$P\left\{X_n = \frac{1}{\sqrt{n}}\right\} = P_n \quad \text{and} \quad P\left\{X_n = 1 + \frac{1}{\sqrt{n}}\right\} = 1 - P_n$$

Examine whether the weak law of large numbers holds for the sequence $\{X_n\}$.
