K20U 1306

Reg. No. : ....

Name : ....

III Semester B.Sc. Degree (CBCSS – Sup./Imp.) Examination, November 2020

(2014 – '18 Admns)

COMPLEMENTARY COURSE IN STATISTICS FOR MATHS/ COMPUTER SCIENCE CORE

3C 03 STA : Standard Probability Distributions

Time : 3 Hours | Max. Marks : 40

Instruction** : **Use** of calculators and statistical tables are **permitted.

PART – A

Answer **all** questions. **Each** question carries **1** mark.

1. Define mathematical expectation.
2. If V(X) = 2, then find V(2X – 1).
3. Define binomial distribution.
4. Define beta distribution of first kind.
5. If X is a normal random variable with mean 30 and standard deviation 5. Find P(X < 25).
6. Specify the distribution for which mean and variance are equal. **(6×1=6)**

PART – B

Answer **any six** questions. **Each** question carries **2** marks.

7. Define raw and central moments of random variable and state the relation between them.
8. If the random variable X ~ N (0, 2), find $E(X^2)$.
9. If X and Y are independent continuous random variables, prove that E(XY) = E(X)E(Y).
10. Define moment generating function. Prove that $M_{aX}(t) = M_X(at)$.
11. Find the characteristic function of rectangular distribution defined in (a, b).

P.T.O.

12. State and prove the reproductive property of the Poisson distribution.
13. Find the moment generating function of geometric distribution.
14. Define convergence in probability. **(6×2=12)**

PART – C

Answer **any four** questions. **Each** question carries **3** marks.

15. Use Tchebychev's inequality to prove that $P(X = \mu) = 1$, if $Var(X) = 0$.
16. Define characteristic function. Show that $\varphi_X(t)$ and $\varphi_X(-t)$ are conjugate functions.
17. Find the mean and standard deviation of the distribution whose mgf is $(0.4e^t + 0.6)^8$.
18. Two random variables X and Y have joint pdf

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

Find $E(X/Y = y)$.

19. If $X \sim B(n, p)$, show that $E\left(\frac{X}{n} - p\right)^2 = \frac{p(1-p)}{n}$.
20. State and prove the memoryless property of the exponential distribution. **(4×3=12)**

PART – D

Answer **any two** questions. **Each** question carries **5** marks.

21. If X and Y are independent Poisson random variates with means μ_1 and μ_2 respectively, find the probability that (i) $X + Y = k$ and (ii) $X = Y$.
22. Define Normal distribution. Derive the mean deviation about the mean of the normal distribution.
23. Let X and Y are independent with a common pdf $f(x) = \begin{cases} e^{-x}, & x \geq 0 \\ 0, & x < 0 \end{cases}$.

Find the pdf of $X - Y$.

24. If X denotes the sum of the numbers obtained when two dice are thrown, obtain an upper bound for $P(|X - 7| \geq 4)$. Compare with the exact probability.

(5×2=10)