Reg. No. : ....

Name : ....

K18U 1918

III Semester B.Sc. Degree (CBCSS – Reg./Sup./Imp.) Examination, November 2018
(2014 Admn. Onwards)
Core Course in Statistics
3B03STA : PROBABILITY DISTRIBUTIONS

Time : 3 Hours Max. Marks : 48

PART – A

(Short Answer)

Answer **all** the **6** questions. **(6×1=6)**

1. Define n^{th} central moment of a random variable X.

2. Find the mean of a binomial variate with $M_x(t) = \left(\frac{1}{2}\right)^5 (1+e^t)^5$.

3. If X & Y are independent random variables, show that $M_{X+Y}(t) = M_X(t).M_Y(t)$.

4. If $X \xrightarrow{d} B(n,p)$, find V (X).

5. State the probability density function of gamma distribution. When will this reduce to exponential distribution ?

6. If X_i's are independent normal random variables with means μ_i and standard deviation σ_i respectively. Find the distribution of $Y = \sum_{i=1}^{n} a_i X_i$.

PART – B

(Short Essay)

Answer **any 7** questions. **(7×2=14)**

7. Find the moment generating function of geometric distribution.

8. A fair coin is tossed five times. Find the chance of getting 3 heads.

P.T.O.

9. What are the important characteristics of a normal curve ?

10. A random variable X has the probability density function $f(x) = \begin{cases} Kx(1-x), & 0 \le x \le 1 \\ 0, & \text{elsewhere} \end{cases}$. Find the value of K.

11. If $X \xrightarrow{d} N(\mu, \sigma)$. Find $M_X(t)$.

12. Define log-normal probability distribution.

13. If $X \xrightarrow{d} B(n, p)$ with probability $b(x; n, p) = \binom{n}{x} p^x (1-p)^{n-x}$, $x = 0, 1, 2 \ldots, n; p + q = 1$.

Show that $b(x+1; n, p) = \frac{n-x}{x+1} b(x; n, p)$.

14. Define Multinomial distribution.

15. If the heights of school children in a district are found to follow normal distribution with $\mu = 56$ and $\sigma = 10$. What percent of children have height ?

a) Less than 40 inches.

b) Between 50 & 60 inches.

PART – C

(Essay)

Answer **any 4** questions. **(4×4=16)**

16. If $X \xrightarrow{d} N(\mu, \sigma)$. Find mode.

17. If $X \xrightarrow{d} N(\mu, \sigma)$. Show that $\mu_{2r} = 1.3.5 \ldots (2r-1)\sigma^{2r}$.

18. Describe beta distribution of first kind. Find its variance.

19. Explain convergence in probability.

20. State and prove central limit theorem.

21. Find the first three central moments of gamma distribution.

PART – D

(Long Essay)

Answer **any 2** questions. **(2×6=12)**

22. Define negative binomial distribution. Find its mean and variance.

23. Let X_1, X_2 be independent and identically distributed Geo (p) random variable and $Y = X_1 + X_2$. Find the conditional probability $P\{X_1 = t | X_1 + X_2 = n\}$.

24. Find the distribution of $Y = \frac{1}{X}$, where $X \xrightarrow{d} \text{Cauchy}(a, h)$.

25. Show that a continuous non-negative random variable X follows the exponential distribution if and only if the relationship $P(X > t + s \mid X > t) = P(X > s)$ holds for all real $t, s \ge 0$.

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