SUBJECT CODE : 15MT/AC/ST35

B. Sc. DEGREE EXAMINATION, NOVEMBER 2017
BRANCH I - MATHEMATICS
THIRD SEMESTER

COURSE   :   ALLIED – CORE
PAPER   :   MATHEMATICAL STATISTICS - I
TIME   :   3 HOURS   MAX. MARKS :   100

SECTION – A   **(10X2=20)**

ANSWER ALL THE QUESTIONS

1. A ball is drawn at random from a box containing 6 red balls, 4 white balls, and 5 blue balls. Determine the probability that it is (a) red, (b) white.
2. Define independent events.
3. Define probability distribution.
4. A random variable X has the density function $f(x) = c/(x^2 + 1)$, $-\infty < x < \infty$, find the value of the constant c.
5. Define characteristic function.
6. Write down the relationship between moments and moment generating functions.
7. Find the binomial distribution if the mean is 12 and the standard deviation is 2.
8. Define Poisson distribution.
9. State any two properties of a normal curve.
10. What is the probability that a standard normal variate Z will be greater than 1.09?

SECTION – B   **(5X8=40)**

ANSWER ANY FIVE QUESTIONS

11. The probabilities that a husband and wife will be alive 20 years from now are given by 0.8 and 0.9 respectively. Find the probability that in 20 years (a) both, (b) neither, (c) at least one, will be alive.

12. The distribution function for a random variable X is $F(x) = \begin{cases} 1 - e^{-2x} & : x \geq 0 \\ 0 & : x < 0 \end{cases}$.

    Find (a) the density function, (b) the probability with $X > 2$.

13. Define mathematical expectation and prove that the quantity $E[(X-a)^2]$ is minimum when $a = E(X)$.

14. Suppose A and B are two equally strong table tennis players. Which of the following two events is more probable: (i) A beats B exactly in 3 games out of 4, or (ii) A beats B exactly in 5 games out of 8?

15. Define normal distribution and write down any five uses of normal distribution.

16. Find the probability of not getting a 7 or 11 total on either of two tosses of a pair of fair dice.

17. Assuming that the typing mistakes per page committed by a typist follows a Poisson distribution, find the expected frequencies for the following distribution of typing mistakes.

No. of mistakes per page	0	1	2	3	4	5
No. of pages	40	30	20	15	10	5

SECTION – C (2X20=40)

ANSWER ANY TWO QUESTIONS

18. (a) Proving conditional probability theorem, derive the Bayes' rule. (10)
    (b) The joint probability function of two discrete random variables X and Y is given by $f(x,y) = c(2x+y)$, $0 \le x \le 2, 0 \le y \le 3$ and $f(x,y) = 0$, otherwise. Find (i) the value of the constant c, (ii) $P(X=2, Y=1)$, (iii) $P(X \ge 1, Y \le 2)$ (10)

19. (a) State and prove Chebyshev's inequality. (10)
    (b) Let $f(x,y) = \begin{cases} xy/96 & : 0 < x < 4, 1 < y < 5 \\ 0 & : \quad otherwise \end{cases}$ be the joint density function of two random variables X and Y. Find (a) $E(X)$, (b) $E(Y)$, (c) $E(XY)$, (d) $E(2X+3Y)$ (10)

20. (a) Out of 320 families with 5 children each, what percentage would be expected to have (i) 2 boys and 3 girls, (ii) at least 1 boy? Assume equal probability for boys and girls. (10)

    (b) In a normal distribution 31% of the items are under 45 and 8% are over 64. Find the mean and standard deviation of the distribution. (10)

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