

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI 600 086
(For candidates admitted during the academic year 2011–12 & thereafter)

SUBJECT CODE : 11MT/MC/PT54

B. Sc. DEGREE EXAMINATION, NOVEMBER 2016

BRANCH I - MATHEMATICS

FIFTH SEMESTER

COURSE : MAJOR – CORE

PAPER : PROBABILITY THEORY

TIME : 3 HOURS

MAX. MARKS : 100

SECTION – A

(10X2=20)

ANSWER ALL THE QUESTIONS

1. Define Independent Events.
2. State Boole's Inequality.
3. Define Distribution function.
4. Define Discrete Random Variable.
5. Prove that $V(ax + b) = a^2V(x)$.
6. What are the properties of Moment Generating function?
7. Define the characteristic function of Binomial Distribution
8. Write the coefficients of Skewness and Kurtosis of Poisson distribution.
9. Define Normal Distribution.
10. Write down the points of inflexion of Normal curve.

SECTION – B

(5X8=40)

ANSWER ANY FIVE QUESTIONS

11. An MBA applies for a job in two firms X and Y . The probability of his being selected in firm X is 0.7 and being rejected at Y is 0.5. The probability of at least one of his applications being rejected is 0.6. What is probability that he will be selected in one of the firms?
12. Joint distribution of X and Y is given by: $f(x, y) = 4xye^{-(x^2+y^2)}$; $x \geq 0, y \geq 0$. Test whether X and Y are independent. For the above joint distribution, find the conditional density of X given $Y = y$.
13. a) Find the expectation of the number on a die when thrown.
b) Two unbiased dice are thrown. Find the expected values of the sum of numbers of points on them.
14. Derive the m.g.f of Binomial Distribution.
15. X is a normal variate with mean 30 and S.D. 5. Find the probabilities that
i) $26 \leq X \leq 40$ ii) $X \geq 45$ iii) $X - 30 > 5$
16. A continuous random variable X has a p.d.f. $f(x) = 3x^2$, $0 \leq x \leq 1$. Find a and b such that i) $P(X \leq a) = P(X > a)$ ii) $P(X > b) = 0.05$.
17. Let the r.v. X assume the value ' r ' with the probability law:
 $P(X = r) = q^{r-1}p$; $r = 1, 2, 3, \dots$ Find the m.g.f of X and hence its mean and variance.

SECTION – C
ANSWER ANY TWO QUESTIONS

(2X20=40)

18. a) State and Prove Baye's theorem.
b) The diameter, say X , of an electric cable, is assumed to be a continuous random variable with p.d.f.: $f(x) = 6x(1 - x), 0 \leq x \leq 1$.
a) Check that the above is a p.d.f.
b) Compute $P \left(X \leq \frac{1}{2} \mid \frac{1}{3} \leq X \leq \frac{2}{3} \right)$.
19. a) State and prove Tchebychev's inequality. (12)
b) If X and Y are independent random variables then prove that $E XY = E X E(Y)$ and generalize the result for n random variables. (8)
20. a) Derive the Recurrence Relation for moments of the Poisson distribution.
b) Write the properties of Normal Distribution.

