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 2014
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. Three unbiased coins are tossed. What is the probability of obtaining at least one head?

2. A husband and wife appear in an interview for two vacancies in the same post. The probability of husband's selection is 1/7 and that of wife's selection is 1/5. What is the probability that both of them will be selected?

3. Define conditional probability of an event.

4. State addition theorem on probability.

5. Define variance of the probability distribution of a random variable X.

6. A die is thrown at random. What is the expectation of number on it?

7. Comment on the distribution whose mean is 12 and variance is 8.

8. Give any two examples of Poisson Distribution.

9. Write down probability density function of a Standard Normal Distribution.

10. State the conditions under which the Binomial Distribution tends to
    (i) the Poisson distribution and
    (ii) the Normal distribution

SECTION – B   **(5X8=40)**
ANSWER ANY FIVE QUESTIONS

11. There are 6 rupee and 9 dollar coins in a bag. A coin is drawn and then replaced. What is the probability that a rupee and a dollar coin are drawn in that order? What would be the probability if the coin drawn were not put back into the bag?

12. State and Prove addition theorem on probability.

13. State and prove Tchebychev's in equality.

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14. For the frequency distribution $f(x)\,dx = \frac{2x}{y}\,dx, 0 \le x \le 3$. Find the mean and the standard deviation.

15. Obtain the recurrence relation for the moments of binomial distribution.

16. Obtain the additive property of independent Poisson variates.

17. Prove that for the normal distribution, the quartile deviation, the mean deviation and standard deviation are approximately 10:12:15.

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SECTION – C (2X20=40)
ANSWER ANY TWO QUESTIONS

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18. a) State and prove Baye's theorem.

    b) If X and Y are random variables, determine whether X and Y are independent in the following cases.

    (i) $f(x,y) = 8xy,\ 0 < x < 1,\ 0 < y < x$

    $\qquad\qquad$ 0, otherwise

    (ii) $f(x,y) = 4xy,\ 0 < x < 1,\ 0 < y < 1$

    $\qquad\qquad$ 0, otherwise

19. a) If X is a random variable, then show that

    (i) $Var(aX + b) = a^2 V(x)$

    (ii) $E(aX + b) = aE(x) + b$

    where a and b are constants.

    b) Determine the binomial distribution for which the mean is 8 and variance 6 and find the mode.

20. a) Fit a Poisson distribution to the following data which gives the number of doddens in a sample of clover seeds.

No. of doddens (x)	0	1	2	3	4	5	6	7	8
Observed frequency (f)	56	156	132	92	37	22	4	0	1

    b) Define normal distribution. Derive the m.g.f of $N(\mu, \sigma)$ and hence derive the moments.

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