LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

**B.Sc.** DEGREE EXAMINATION – **PHYSICS**

THIRD SEMESTER – **NOVEMBER 2012**

# MT 3102/3100 - MATHEMATICS FOR PHYSICS

 Date : 07/11/2012 Dept. No. Max. : 100 Marks

 Time : 9:00 - 12:00

**SECTION A**

**ANSWER ALL QUESTIONS. (10 x 2 = 20)**

01. Find the *n*th derivative of .

02. Find the slope of the curve  at .

03. Write the expansion for .

04. Find the rank of the matrix .

05. Find the Laplace transform of .

06. Find .

07. Write down the expansion of  in powers of .

08. Show that .

09. Two dice are thrown. What is the probability that the sum of the numbers is greater than 8?

10. Define Normal distribution.

**SECTION B**

**ANSWER ANY FIVE QUESTIONS. (5 x 8 = 40)**

11. Find the *n*th differential coefficient of .

12. Find the maximum value of  for positive values of *x*.

13. Find the characteristic roots of the matrix .

14. Find the Laplace transform of .

15. Express  in a series of sines of multiple of .

16. Four cards are drawn at random from a pack of 52 cards. Find the probability that

(i) they are a king, a queen, a jack and an ace.

(ii) two are kings and two are queens.

(iii) two are black and two are red.

17. A car hire firm has two cars, which it hires out day by day. The number of demands for a car on each day is distributed as a Poisson distribution with mean 1.5. Calculate the proportion of days on which (i) neither car is used, (ii) the proportion of days on which some demand is refused.

18. X is a normal variable with mean 30 and standard deviation 5. Find the probabilities that

 (i) 26  X  40, (ii) X  45.

**SECTION C**

**ANSWER ANY TWO QUESTIONS. (2 x 20 = 40)**

19. (a) If , then prove that .

 (b) Find the length of subtangent and subnormal at any point *t* on the curve  and . (12 + 8)

20. (a) Verify Cayley-Hamilton theorem for the matrix  and also find .

 (b) Find the sum to infinity of the series . (12 + 8)

21. (a) Express  in terms of .

 (b) Find the mean and standard deviation for the following data:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| *x* | 10 | 20 | 30 | 40 | 50 | 60 |
| *f* | 15 | 32 | 51 | 78 | 97 | 109 |

 (10 + 10)

22. (a) Solve the equation  given that  when .

 (b) Ten coins are thrown simultaneously. Find the probability of getting at least seven

 heads? (12 + 8)