



# LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.S.C., B.C.A., DEGREE EXAMINATION – STAT., PHY., CHEM., COMP.SCI., & COMP.APP.

THIRD SEMESTER – APRIL 2017

## MT 3206- APPLIED MATHEMATICS

Date: 04-05-2017  
09:00-12:00

Dept. No.

Max. : 100 Marks

### PART – A

Answer ALL questions.

(10 × 2 = 20)

1. Integrate  $x^{3/2}$  with respect to  $x$ .
2. Define Marginal Cost.
3. State any two rules of vector differentiation.
4. Find the maximum value of the directional derivative of the function  $\phi = 2x^2 + 3y^2 + 5z^2$  at the point  $(1, 1, -4)$ .
5. Define Ordinary differential equation.
6. Write the degree of the following differential equation
  - (i)  $y \frac{dy}{dx} = \sqrt{x} \left( \frac{\partial y}{\partial x} \right)^2 + k$ .
  - (ii)  $(y - x \frac{dy}{dx})^2 = k^2 (1 + (\frac{dy}{dx})^2)$ .
7. Prove that  $L\{1\} = \frac{1}{s}$  if  $s > 0$ .
8. State shifting property in Laplace Transforms.
9. Find  $L(e^{2t})$ .
10. Define Spearman's rank correlation coefficient.

### PART – B

Answer any FIVE questions.

(5 × 8 = 40)

11. If demand function is  $y = 32 - 4x - x^2$ , find the Consumer Surplus if  $x_0 = 3$ .
12. If  $f(x) = x(x^2 - 4)^2$ ,  $1 \leq x \leq 3$ . Then prove that
  - (i)  $\int_a^b f(x) dx = -\int_b^a f(x) dx$
  - (ii)  $\int_{-a}^a f(x) dx = 0$ .
13. A particle moves along a curve whose position vector at any time  $t$  is given by  $\vec{r} = t^3 \vec{i} + (t^2 - 1) \vec{j} + 4t \vec{k}$ . Find the velocity and acceleration at time  $t = 1$ .
14. Evaluate  $\nabla(\log r)$  where  $r = |\vec{r}|$ ,  $\vec{r} = x \vec{i} + y \vec{j} + z \vec{k}$ .
15. Find the Laplace transform of  $f(t) = \begin{cases} 1 & 0 < t < b \\ -1 & b < t < 2b \end{cases}$
16. Find  $L^{-1} \left( \frac{1}{s(s+1)(s+2)} \right)$ .
17. Calculate the coefficient of correlation.

X	1	2	3	4	5
Y	10	20	30	50	40

18. A person walks 27km at a speed of 3 km per hour and again walks 24 km at a speed of 4 km per hour. What is the average speed in km per hour?

**PART – C**

Answer any TWO questions.

(2 × 20 = 40)

19. (a) If the marginal revenue function is  $R'(x) = 12 - 8x + x^2$ , determine the revenue and demand function.

(b) Find the centre of gravity of a uniform lamina in the form of a quadrant of an ellipse  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ .  
(8+12)

20. Evaluate  $\iint_S \vec{F} \cdot \vec{n} \, ds$  where  $\vec{F} = xy\vec{i} - x^2\vec{j} + (x+z)\vec{k}$  and  $S$  is the plane  $2x + 2y + z = 6$  in the first octant.

21. (a) Solve  $\frac{d^2y}{dt^2} - 4\frac{dy}{dt} + 5y = 4e^{3t}$  given that  $y(0) = 2, y'(0) = 7$ .

(b) Find  $L(e^{7t} \sin^2 t)$ .  
(12+8)

22. (a) In certain culture yeast the amount  $A$  of active yeast grows at a rate proportional to the amount present. If the original amount  $A_0$  doubles in 2 hrs, how long does it take for the original amount to triple.

(b) Calculate the standard deviation, coefficient of variation and variance for the following data:

Roll. No.	5	15	25	35	45	55
Marks	10	20	30	50	40	30

(5+15)

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