



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.C.A., B.Sc DEGREE EXAMINATION – COM. SCI. & APP., PHY., STA., CHEM.

THIRD SEMESTER – NOVEMBER 2016

MT 3206 - APPLIED MATHEMATICS

Date: 10-11-2016
Time: 09:00-12:00

Dept. No.

Max. : 100 Marks

PART – A

Answer ALL questions.

(10 × 2 = 20)

1. Integrate $3x^2 + 2x + 6$ with respect to x .
2. Define Average Cost.
3. State any two rules of vector differentiation.
4. If $\vec{F} = t^3\vec{i} + t^2\vec{j} + (3t + 1)\vec{k}$. Find $\frac{d^2\vec{F}}{dt^2}$.
5. Define Partial differential equation.
6. Identify the degree of the following differential equations
 - (i) $y = \sqrt{x} \frac{dy}{dx} + \frac{k}{dx}$.
 - (ii) $\frac{\partial^4 \phi}{\partial x^4} + 2 \frac{\partial^4 \phi}{\partial^2 x \partial^2 y} + \frac{\partial^4 \phi}{\partial y^4} = F(x, y)$.
7. State the change of scale property in Laplace Transforms.
8. Prove that $L\{1\} = \frac{1}{s}$ if $s > 0$.
9. Find $L^{-1}\left(\frac{1}{s+4}\right)$.
10. Define Spearman's rank correlation coefficient.

PART – B

Answer any FIVE questions.

(5 × 8 = 40)

11. If supply function is $y = 2x^2 + 4$, given $x_0 = 2$, $p_0 = 12$. Find Producers Surplus.
12. A particle moves along a curve whose position vector at any time t is given by $x = t^3 + 1$, $y = t^2$, $z = 2t + 5$. Find the component of its velocity and acceleration at time $t = 1$ in the direction $2\vec{i} + 3\vec{j} + 5\vec{k}$.
13. Prove that $\text{div}(r^n \vec{r}) = (n + 3)r^n$.
14. A fossilized bone is found to contain $\frac{1}{1000}$ to the original amount of ^{14}C (Carbon – 14). Determine the age of the fossil.
15. A 12V battery is connected to a simple series circuit in which the inductance is $\frac{H}{2}$ and the resistance is 10Ω . Determine the current i of $i(0) = 0$.
16. Find the Laplace transform of the following function $f(t) = \begin{cases} t & 0 < t < 1 \\ 0 & 1 < t < 2 \end{cases}$.
17. Find $L^{-1}\left(\frac{1}{s(s+1)(s+2)}\right)$.
18. From the following data calculate the coefficient of correlation.

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

PART – C

Answer any TWO questions.

(2 × 20 = 40)

19. (a) Find the centre of gravity of a semi-circular lamina defined by $x^2 + y^2 \leq 4$; $x \geq 0$.

(b) Evaluate $\int_0^3 \int_1^2 xy(x + y) dydx$ and $\int_1^2 \int_0^3 xy(x + y) dydx$ and show that they are equal.

(10+10)

20. (a) Evaluate $\int_S \vec{F} \cdot \vec{n} ds$ 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.

(b) Show that the vector $3x^2y\vec{i} - 4xy^2\vec{j} + 2xyz\vec{k}$ is solenoidal.

(15+5)

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

(b) The body of a murder victim was discovered at 11.00 pm. The doctor took the temperature of the body at 11.30 pm which was 94.6° . He again took the temperature after 1 hour when it showed 93.4° , and noticed that the temperature of room was 70° . Estimate the time of death **(12+8)**

22. Calculate the mean, 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

(20)
