



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.SC. DEGREE EXAMINATION – STATISTICS

FIRST SEMESTER – APRIL 2016

MT 1101 - MATHEMATICS FOR STATISTICS

Date: 05-05-2016
Time: 01:00-04:00

Dept. No.

Max. : 100 Marks

PART A

Answer all the questions:

(10 X 2 = 20)

1. If $f(x) = 3x^3 - 5x^2 + 6x - 4$, find the values of $f(-2)$ and $f(1)$.
2. Differentiate $(x^2 + 1)(x + 2)$ with respect to x .
3. Find the range of values of x for which the function $x^3 - 6x^2 - 36x + 7$ is increasing with x .
4. State Mean Value theorem.
5. Using Maclaurin's series, expand $\sin x$ as an infinite series.
6. Find the first order partial differential coefficients of $u = \log(7x + 4y)$.
7. Integrate $ax + \frac{b}{x^2}$ with respect to x .
8. Evaluate $\int e^{3x+7} dx$.
9. Write any two properties of definite integrals.
10. Find $\int_0^{\frac{\pi}{2}} \cos^4 x dx$.

PART B

Answer any FIVE questions:

(5 X 8 = 40)

11. Evaluate $\lim_{x \rightarrow 1} \frac{x^4 - 3x^3 + 2}{x^3 - 5x^2 + 3x + 1}$.
12. Differentiate $\frac{(x^2 - 1)^{4/5} (3x + 5)^{2/7} e^{3x}}{(x - 9)^{1/2} (2x - 7)^4}$ with respect to x .
13. If x is positive, show that $x > \log(1 + x) > \frac{x}{x+1}$.
14. Verify Euler's theorem when $u = x^3 + y^3 + z^3 + 3xyz$.
15. Integrate the following with respect to x :
(i) $\frac{1}{\sin^2 x \cos^2 x}$ (ii) $\frac{3x^2 + 4x - 5}{\sqrt{x}}$
16. Evaluate $\int \frac{dx}{4x^2 - 4x + 2}$.
17. Prove that $\int_0^{\frac{\pi}{2}} \frac{(\sin x)^3}{(\sin x)^2 + (\cos x)^2} dx = \frac{\pi}{4}$.
18. Evaluate $\int xy dy dx$ taken over the positive quadrant of the circle $x^2 + y^2 = a^2$.

PART C

Answer any TWO questions:

(2 X 20 = 40)

19. (a) If $f(x) = x^2 + x - 1$, simplify $f(x + 3) - 3f(x) + 2f(x - 1) - 5f(x + 1)$.

(b) Find the points of inflexion on the cubic $y = \frac{a^3x}{x^2+a^2}$ and show that they lie on a straight line.

(8+12)

20. (a) Find the maximum and minimum values of the function $y = \frac{2}{3}x^3 + \frac{1}{2}x^2 - 6x + 8$.

(b) Using mean value theorem, determine c , lying between a and b , when

(i) $f(x) = x^3 - 2x^2, a = 2, b = 5$

(ii) $f(x) = x^3 + x, a = 1, b = 2$

(10+10)

21. (a) If $r^2 = (x - a)^2 + (y - b)^2 + (z - c)^2$, prove that $\frac{\partial^2 r}{\partial x^2} + \frac{\partial^2 r}{\partial y^2} + \frac{\partial^2 r}{\partial z^2} = \frac{2}{r}$.

(b) Evaluate $\int \frac{x}{(x-1)(x-2)(x-3)} dx$.

(10+10)

22. (a) Solve $\int_0^{\pi/2} \sin^2\theta(\sin^6\theta + \cos^3\theta) d\theta$.

(b) Find the value of $\int_0^a \int_0^x (x^2 + y^2) dy dx$.

(c) By transforming into polar coordinates, evaluate $\iint \frac{x^2y^2}{x^2+y^2} dx dy$ over the annular region between the circles $x^2 + y^2 = a^2$ and $x^2 + y^2 = b^2$ ($b > a$).

(6+4+10)
