LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc.DEGREE EXAMINATION – **STATISTICS**

FIRSTSEMESTER – APRIL 2018

MT 1101- MATHEMATICS FOR STATISTICS

Date: 28-04-2018 Dept. No. Max. : 100 Marks
Time: 09:00-12:00

PART A

Answer all the questions: **(10 X 2 = 20)**

1. If $y = 6x^3 - 2x^2 + 7x - 4$, find the values of y when $x = 2$ and $x = 1$.
2. Differentiate $6x^9 - 2x + \frac{1}{x}$ with respect to x.
3. For what values of x is $2x^3 - 9x^2 + 12x + 4$ a decreasing function?
4. State Mean Value theorem.
5. Using Maclaurin's series, expand e^x as an infinite series.
6. Find the first order partial differential coefficients of $u = log(7x + 4y)$.
7. Integrate $3x^2 + 4x - 5$ with respect to x.
8. Evaluate $\int e^{3x+7} dx$.
9. Write any two properties of definite integrals.
10. Find $\int_{-1}^{1} (x^2 + 7x + 3)\, dx$.

PART B

Answer any FIVE questions: **(5 X 8 = 40)**

11. Evaluate $\lim_{x\to 1} \frac{x^4-3x^3+2}{x^3-5x^2+3x+1}$.
12. Differentiate $\frac{(x^2+1)^{4/5}(3x-5)^{3/7}\ e^{2x}}{(x+2)^{1/2}(2x+1)^3}$ with respect to x.
13. If x is positive, show that $x - \frac{1}{2}x^2 < \log(1 + x) < x - \frac{1}{2}x^2 + \frac{1}{3}x^3$.
14. If $u = log(x^2 + y^2 + z^2)$, prove that $x \frac{\partial^2 u}{\partial y\, \partial z} = y \frac{\partial^2 u}{\partial z\, \partial x} = z \frac{\partial^2 u}{\partial x\, \partial y}$
15. Integrate $x^2 e^{3x}$ with respect to x
16. Evaluate $\int \frac{2x+3}{x^2+x+1} dx$.
17. Prove that $\int_0^{\frac{\pi}{2}} \frac{(sinx)^{\frac{3}{2}}}{(sinx)^{\frac{3}{2}}+(cosx)^{\frac{3}{2}}} dx = \frac{\pi}{4}$.
18. Evaluate $\iint (x^2 + y^2)\, dxdy$ over the region for which $x, y \geq 0$ and $x + y \leq 1$.

PART C

Answer any TWO questions: **(2 X 20 = 40)**

19. (a) If $y = sinx\ sin2x\ sin3x\ sin4x$, find $\frac{dy}{dx}$.
    (b) For what values of x is the curve $y = 3x^2 - 2x^3$ concave upwards and when is it convex upwards. Also find the point of inflexion. (8+12)

20. (a) Find the maximum and minimum values of the function $y = 2x^3 - 3x^2 - 36x + 10$.
    (b) Verify Rolle's theorem for the function
    (i) $f(x) = x(x - 3)^2$ on $[0,3]$
    (ii) $f(x) = (x - a)^m (x - b)^n$ on $[a, b]$ (12+8)

21. (a) Verify Euler's theorem when $u = x^3 + y^3 + z^3 + 3xyz$.

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

(12+8)

22. (a) Prove that $\int_0^{\frac{\pi}{4}} log(1 + tan\theta)\, d\theta = \frac{\pi}{8} log2$.

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

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(8+12)

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