LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FIRST SEMESTER – NOVEMBER 2015

MT 1101 - MATHEMATICS FOR STATISTICS

Date : 11/11/2015 Dept. No. Max. : 100 Marks

Time : 01:00-04:00

PART A

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

1. If $f(x) = (2x-1)(x-3)$, find the values of $f(2)$ and $f\left(\frac{1}{2}\right)$.
2. Differentiate $6x^9 - 2x + \frac{1}{x}$ with respect to x.
3. For what values of x is $2x^3 - 15x^2 - 84x + 7$ a decreasing function?
4. Find the point of inflexion on $y = x^3 - 9x^2 + 7x - 6$.
5. Using Maclaurin's series, expand $tan\ x$ as an infinite series.
6. Find the first order partial differential coefficients of $u = cos(7x + 4y)$.
7. Integrate $\left(x + \frac{1}{x}\right)^2$ with respect to x.
8. Evaluate $\int \frac{dx}{4+9x^2}$.
9. Write any two properties of definite integrals.
10. Find $\int_1^2 (2x^2 + x - 5)\, dx$.

PART B

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

11. (a) Find the differential coefficient of $log\left(\frac{x-\sqrt{1-x^2}}{x+\sqrt{1-x^2}}\right)$.

    (b) If $y = xe^x sinx$, find $\frac{dy}{dx}$. **(5+3)**
12. Show that the curve $y = \frac{6x}{x^2+3}$ has three points of inflexion.
13. Show that when x is positive, $x - \frac{1}{6}x^3 < \sin x < x$.
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 $x^2 cos3x$ with respect to x.
16. Evaluate $\int \frac{x}{\sqrt{x^2+x+1}} dx$.
17. Prove that $\int_0^{\frac{\pi}{2}} log\ sinx\, dx = \frac{\pi}{2} log\left(\frac{1}{2}\right)$.
18. Evaluate □ $(x^2 + y^2)\, dxdy$ 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) Evaluate $\lim_{x\to 1} \frac{x^4-3x^3+2}{x^3-5x^2+3x+1}$.

    (b) If $y = sinx\ sin2x\ sin3x\ sin4x$, find $\frac{dy}{dx}$.

    (c) Differentiate $x^{(logx)^2}$ with respect to $(xlogx)(loglogx)$ **(7+6+7)**

20. (a) Find the maximum and minimum values of the function $y = x^3 - 18x^2 + 96x + 4$.

    (b) Verify Rolle's theorem for the following functions:

    (i) $f(x) = (x-2)\sqrt{x}$ on $[0,2]$

    (ii) $f(x) = (x-a)^m(x-b)^n$ on $[a,b]$

    (iii) $f(x) = e^x sinx$ on $[0,\pi]$ **(10+10)**

21. (a) Verify Euler's theorem when $u = x^3 - 3x^2y + 3xy^2 + y^3$.

    (b) If $u = log(tanx + tany + tanz)$, show that $sin2x\frac{\partial u}{\partial x} + sin2y\frac{\partial u}{\partial y} + sin2z\frac{\partial u}{\partial z} = 2$.

    (c) Integrate $\frac{x^2+2x+5}{x^2+1}$ with respect to x.

    (8+5+7)

22. (a) Evaluate $\int \frac{3x+1}{(x-1)^2(x+3)}dx$.

    (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 $x^2 + y^2 = b^2$ $(b > a)$.

    . **(10+10)**

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