LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FIRST SEMESTER – **NOVEMBER 2016**

MT 1101 – MATHEMATICS FOR STATISTICS

Date: 09-11-2016 Dept. No. Max. : 100 Marks

Time: 01:00-04:00

PART A

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

1. If $f(x) = (4x-1)(x-5)$, find the values of $f(3)$ and $f\left(\frac{1}{2}\right)$.
2. Differentiate $\frac{x^3}{3x-2}$ with respect to x.
3. For what value of x is $6x^3 - 2x^2 + 7x - 4$ 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 x^2e^x with respect to *x*.
8. Evaluate $\int \frac{dx}{4+9x^2}$.
9. Write any two properties of definite integrals.
10. Find $\int_1^2 (2x^3 + x - 4)\, dx$.

PART B

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

11. (a) If $y = \frac{(x+3)}{(x+2)}$, find $\frac{dy}{dx}$.

    (b) Prove that the tangents to the curve $y = x^2 - 5x + 6$ at the points (2,0) and (3,0) cut at right angles. (3+5)
12. Show that the curve $y = \frac{5x}{x^2+3}$ has three points of inflexion.
13. Using mean value theorem, determine *c*, lying between *a* and *b*, when

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

    (ii) $f(x) = x^3 + x, \quad a = 1, b = 2$.
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^2cos3x with respect to x.
16. Evaluate $\int \frac{x}{x^2+x+1} dx$.
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) If $f(x) = x^3 + x^2 + x - 1$, simplify $f(x+1) - 3f(x) + 2f(x-1)$

    (b) If $y = sinx\, sin2x\, sin3x$, 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) Prove that $log(1 + x + x^2) = x + \frac{1}{2}x^2 - \frac{2}{3}x^3 + \frac{1}{4}x^4 + \cdots$. (10+10)

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

(b) Prove that $\int_0^{\frac{\pi}{4}} log(1 + tan\theta)\, d\theta = \frac{\pi}{8} log2$. (10+10)

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

(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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