LOYOLA COLLEGE (AUTONOMOUS) CHENNAI 600 034

B. Sc. Degree Examination – Statistics

First Semester – November 2014

MT 1101 – MATHEMATICS FOR STATISITICS

Date: Max: 100 Marks

Time: Dept. No.

SECTION A

ANSWER ALL QUESTIONS. **(10 × 2 = 20)**

1. If $f(x) = x^2 + x - 1$, simplify $f(x + 1) - 3f(x) + 2f(x - 1)$.
2. Find $\lim_{x\to 0}\frac{e^x-1}{x}$.
3. For what values of x is the curve $y = 3x^3$ concave upwards?
4. State Rolle's theorem.
5. Find $\int \frac{dx}{x^2+2x+5}$.
6. Prove that $\int_0^{\pi/2} sin^6 x dx = \frac{5\pi}{32}$
7. Find $\int xe^x dx$.
8. Find $\int_0^1 x(1-x)^n dx$.
9. What is the value of $\int_0^a \int_0^b xy dy dx$.
10. Find the integral of $\frac{1}{(x+3)(x+4)}$.

SECTION B

ANSWER ANY FOUR QUESTIONS. **(5 × 8 = 40)**

11. Find the differential coefficient of $2x cos x - x^2 sin x$ with respect to x.
12. Differentiate $tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right)$ with respect to $tan^{-1}x$.
13. If $V = (x^2 + y^2 + z^2)^{-1/2}$, show that $\frac{\partial^2 V}{\partial x^2} + \frac{\partial^2 V}{\partial y^2} + \frac{\partial^2 V}{\partial z^2} = 0$.
14. Find $\int \frac{x}{\sqrt{x^2+x+1}} dx$.
15. Evaluate $\int_0^{\pi} \frac{dx}{5+4cos x}$
16. Find the reduction formula for $\int_0^{\pi/2} cos^n x dx$ and hence find $\int_0^{\pi/2} cos^5 x dx$.
17. Find the value of $\int\int xy dx dy$ taken over the positive quadrant of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.
18. Find the series expansion of $sin x$.

SECTION C

ANSWER ANY TWO QUESTIONS. **(2 x 20 = 40)**

19. a) Differentiate the functions: (i) $\frac{3cosecx+2}{7+3cotx}$ (ii) $y = log(tane^x)$.

b) Find the maximum value of $\frac{logx}{x}$ for positive values of x. (6 + 6 + 8)

20. a) Show that the curve $y = \frac{6x}{x^2+3}$ has three points of inflexion.

b) Evaluate $\int \frac{x}{(x-1)^2(x+2)} dx$ (10 + 10)

21. a) Prove that $\int_0^{\pi/4} \log(1 + tanx)\, dx = \frac{\pi}{8} log2.$

b) Evaluate $\int_0^{\pi/2} logsinxdx.$ (10 + 10)

22. If $(m,n) = \int_0^{\pi/2} cos^m xcosnxdx$, then prove that $f(m,n) = \frac{m}{m+n} f(m-1, n-1)$ and hence prove that $f(n,n) = \frac{\pi}{2^{n+1}}$.

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