LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **MATHEMATICS**

SECONDSEMESTER – APRIL 2017

MT 2501 / MT 2500 - ALGEBRA, ANAL.GEO & CALCULUS - II

Date: 04-05-2017 Dept. No. Max. : 100 Marks
01:00-04:00

PART-A

Answer all questions: **(10 x 2 =20)**

1. Evaluate $\int \frac{x^5 dx}{a^6+x^6}$.

2. Evaluate $\int \frac{dx}{x^2+2x+5}$.

3. Define differential equations with an example.

4. Write down the Bernoulli's equation.

5. State comparison test.

6. State Cauchy's root test.

7. Write down the expansion of $(3x+5y)^5$.

8.Find the middle term in the expansion of $(1+x)^{2n}$.

9. Find the distance of the origin from the plane $6x-3y+2z-14=0.$

10. Find the equation of the sphere of radius 4 and centre(1,2,3) .

PART-B

Answer any FIVE questions **(5 x 8 = 40)**

11. Evaluate $\int_0^{\frac{\pi}{2}} \log \sin x \, dx.$

12. Find the area of the surface of the solid generated by rotating the cardioid $r = a(1+\cos\theta)$ about its line of symmetry.

13. Solve $(1-x^2)\frac{dy}{dx} + 2xy = x\sqrt{1-x^2}$ given that y=0 when x=0.

14. Solve $(D^2+16)y = 2e^{-3x} + \cos 4x.$

15. Examine the convergence of the series $\sum \frac{(n+1)(n+2)...(n+n)}{n^n}$.

16. Find the sum to the series $1+(\frac{1}{2}+\frac{1}{3})\frac{1}{4}+(\frac{1}{4}+\frac{1}{5})\frac{1}{4^2}+.....$

17. Find the shortest distance between the lines
$\frac{x-3}{-1}=\frac{y-4}{2}=\frac{z+2}{1}; \frac{x-1}{1}=\frac{y+7}{3}=\frac{z+2}{2}.$

18. Find the equation of the sphere which passes through the circle
$x^2+y^2+z^2-2x-4y=0, x+2y+3z=8$ and touch the plane 4x+3y=25.

PART-C

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

19. (a) Find the reduction formula for $I_n = \int \sin^n x\,dx$ where n ∈N and hence find $\int_0^{\pi/2} \sin^n x\,dx$.

(b)Find $\int_{-\pi/2}^{\pi/2} x \sin x \cos x\,dx$. **(12+8)**

20.(a) Solve $(D^2+2D+5)y = xe^x$.

(b) Solve $\frac{d^2y}{dx^2}+y=\sec x.$

(8+12)

21.(a) Find the sum to the series $\frac{1}{24}-\frac{1.3}{24.32}+\frac{1.3.5}{24.32.40}-.....$.

(b) Find the sum to the series $\frac{5}{1!}+\frac{7}{3!}+\frac{9}{5!}+.....$ **(10+10)**

22.(a) Examine the convergence of $\frac{1^2}{2^2}+\frac{1^2.3^2}{2^2.4^4}+\frac{1^2.3^2.5^2}{2^2.4^2.6^2}+.....$.

(b) Find the equations of the image of the line $\frac{x-1}{2}=\frac{y+2}{-5}=\frac{z-3}{2}$ in the plane 2x- 3y+2z+3=0.

(8+12)

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