LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

THIRD SEMESTER – **APRIL 2016**

MT 3501/MT 3500 – ALGEBRA, CALCULUS AND VECTOR ANALYSIS

Date: 28-04-2016 Dept. No. Max. : 100 Marks

Time: 09:00-12:00

PART-A

Answer ALL the Questions: **[10x2=20marks]**

1. Evaluate $\int_o^a \int_o^b \int_o^c dx\, dy\, dz$.
2. Evaluate $\int_0^{\pi/2} \sin^5\theta \cos^3\theta\, d\theta$.
3. Solve pq = 1.
4. Form PDE by eliminating the arbitrary function $z = f(x^2 + y^2)$.
5. Prove that div $\vec{r}$ = 3 where $\vec{r}$ is the position vector of the point (x, y, z).
6. State Green's theorem.
7. Evaluate $L\,[te^{-5t}]$.
8. Evaluate $L^{-1}\left(\frac{1}{(s+2)^2+16}\right)$.
9. State Fermat's theorem.
10. Find the number and sum of all divisors of 360.

PART - B

Answer any FIVE questions: **[5x8=40 Marks]**

11. Evaluate $\iint xy\, dx\, dy$ over the region in the positive quadrant for which x+y=1.
12. Prove that $\overline{n+1} = n\overline{n}$.
13. Solve $x^2 p + y^2 q = z^2$.
14. a) Solve $\frac{\partial^2 z}{\partial x\, \partial y} = x + y$.

    b) Solve $p^2 + q^2 = x^2 + y^2$. **(4 + 4)**
15. Evaluate $L\left(\frac{1-\cos t}{t}\right)$.
16. Evaluate $L^{-1}\left[\frac{1}{s(s+1)(s+2)}\right]$.
17. If □□ = $2xyz\vec{i} + x^2 z\vec{j} + x^2 y\vec{k}$. Find the scalar potential □.
18. Show that $13^{2n+1} + 9^{2n+1}$ is divisible by 22.

PART – C

Answer any TWO questions. **[2x20=40 Marks]**

19. a) Prove that [illegible] $n) = \beta(m$ [illegible] $_{m+n}$.

b) Evalua[illegible] e^{-} [illegible] (15+5)

20. a) Solve ([illegible] $z - 4y)$ [illegible] $x - 2$ [illegible]

b) Solve ([illegible] $z^2 + q^2)$ [illegible] (10+10)

21. a) Verify the Divergence theorem for [illegible] taken over cube x=0, x=1, y=0, y=1, z=0 and z=1.

b) State and Prove Wilson's theorem. (10+10)

22. U[illegible] Laplac[illegible]nsform to Solve the equation [illegible] ye^{2t} given that [illegible] $= -3$, [illegible] $= 5$.

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