23. Verify Gauss divergence theorem for $\vec{F} = 4xz\vec{i} - y^2\vec{j} + yz\vec{k}$ over the cube bounded by $x = 0,\ x = 1,\ y = 0,\ y = 1,\ z = 0,\ z = 1$.

24. Using Laplace transform solve

$$\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 3y = e^{-t} \text{ given that } y(0) = 1,\ y'(0) = 0.$$

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I B.Sc (CS) - Mathematics - II

NOVEMBER 2019 **50409/SBAMB**

Time : Three hours Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer any TEN questions

1. Solve $(D^3 - 3D + 2)y = 0$.

2. Find PI of $(D^2 + 5D + 6)y = e^x$

3. Eliminate 'a' from $z = a(x + y)$.

4. Form the partial differential equation by eliminating the arbitrary function from $z = f(x) + e^y g(x)$.

5. If $\vec{F} = x^2\vec{i} + y^2\vec{j} + z^2\vec{k}$, find $\nabla.\vec{F}$

6. If $\vec{F} = xz^3\vec{i} - 2x^2yz\vec{j} + 2yz^4\vec{k}$, find curl $\vec{F}$ at (1,–1,1).

7. State Green's theorem.

8. Define volume integral.

9. If $\vec{F} = 3xy\vec{i} - y^3\vec{j}$, evaluate $\int \vec{f}.d\vec{r}$ along $y = x$ from (0,0) to (1,1,).

10. Find $L(5-3t-2e^{-t})$

11. Find $L(e^{-2t}\cos t)$.

12. Find $L^{-1}\left\{\frac{s}{(s-3)^2+4}\right\}$

SECTION B — (5 × 5 = 25 marks)

Answer any FIVE questions

13. Solve $(D^2+9)y=(x^2+1)e^{3x}$.

14. Solve $x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}+y=\log x$.

15. Solve $(y^2+Z^2)p-xyq=-xz$.

16. Solve $P^2+Pq=Z^2$.

17. Find the directional derivative of $f=xyz$ at $(1,1,1)$ in the direction of $\vec{i}+\vec{j}+\vec{k}$.

18. Evaluate by stoke's theorem $\int_c (e^x dx+2ydy=dz)$ where C is the curve $x^2+y^2=4, Z=2$.

19. Find $L^{-1}\left\{\frac{1-s}{(s+1)(S^2+4s+13)}\right\}$

SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions

20. Solve $(5+2x)^2\frac{d^2y}{dx^2}-6(5+2x)\frac{dy}{dx}+8y=6x$.

21. Solve $p^2+q^2-2px-2qy-1=0$.

22. Prove that

$$\nabla\times(\phi\vec{F})=\nabla\phi\times\vec{F}+\phi(\nabla\times\vec{F})$$