

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

24. Using Laplace transform solve

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

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  $\nabla \cdot \vec{F}$
6. If  $\vec{F} = xz^3\vec{i} - 2x^2yz\vec{j} + 2yz^4\vec{k}$ , find  $\text{curl } \vec{F}$  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  $\int \vec{f} \cdot d\vec{r}$  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  $\int_C (e^x dx + 2y dy - dz)$  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

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