NOVEMBER 2017 **50409/SBAMB**

Time : Three hours Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer any TEN questions.

1. Solve $(7D^2 + 3D + 11)y = 0$.

2. Solve $(D^2 + D + 1)y = e^{7x}$.

3. Solve $(D^2 - 9)y = \sin 3x$.

4. Solve $\frac{\partial^2 z}{\partial x \partial y} = 0$.

5. Solve $p = q^2$.

6. Solve $p + q = x + y$.

7. If $\vec{r} = x\vec{i} + y\vec{j} + z\vec{k}$, prove that $curl\,\vec{r} = 0$.

8. Find unit normal to $\phi = x^2y + 2xz - 4$ at $(2, -2, 3)$.

9. Prove that $div(\phi\vec{u}) = \nabla\phi\vec{u} + \phi div\vec{u}$.

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10. State Stoke's theorem.

11. Find $L(\sin^2 2t)$.

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

PART B – (5 × 5 = 25 marks)

Answer any FIVE questions.

13. Solve $(D^2 - 3D + 2)y = \cos 3x \cos 2x$.

14. Solve $(D^2 - 4D - 5)y = e^{3x} + 4\cos 3x$.

15. Solve $4z^2p^2 + y = 2zp - x$.

16. Solve $yp - xq + x^2 - y^2 = 0$.

17. Evaluate $\int_0^\infty \frac{e^{-t}\sin t}{t}\,dt$ using Laplace transforms.

18. If $\nabla\phi = yz\vec{i} + zx\vec{j} + xy\vec{k}$, find ϕ.

19. Show that :

$\vec{F} = (6xy + z^3)\vec{i} + (3x^2 - z)\vec{j} + (3xz^2 - y)\vec{k}$

is irrotational.

PART C – (3 × 10 = 30 marks)

Answer any THREE questions.

20. Solve $(x^2D^2 + 4xD + 2)y = x\log x$.

21. Solve $\frac{d^2y}{dx^2} + 4y = \tan^2 2x$ by using the method of variation of parameter.

22. Solve $3pxy + qz^2 = -yz$.

23. Verify Green's theorem in the plane for $\int_C (3x^2 - 8y^2)dx + (4y - 6xy)\,dy$ where C is the boundary of $x = 0$, $y = 0$, $x + y = 1$.

24. Solve $\frac{dx}{dt} + 2x - 3y = t$; $\frac{dy}{dt} - 3x + 2y = e^{2t}$.