Reg. No. ....

FIFTH SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2013

(UG–CCSS)

Mathematics (Core Course)

MM 5B 08—DIFFERENTIAL EQUATIONS

Time Three Hours | Maximum 30 Weightage

Part A

Answer all **twelve** *questions.*

1. State $f(x) = x \cos x$ is even or odd.

2. Solve $\frac{dy}{dx} + \frac{x}{y} = 0$.

3. Write the order of the differential equation $\frac{y}{dx} + 2\left(\frac{d\ y}{dx}\right) \quad \frac{dy}{dx} + y = 0$.

4. Write the necessary condition for the differential equation $M(x, y)\,dx + N(x, y)\,dy = 0$ to be exact.

5. Show that $(Ax, By)\,dx + (Cx, Dy)\,dy = 0$ is exact if $B = C$.

6. Verify that $\sin x$ is a solution of $\frac{d\ y}{dx^2} + y \quad 0$.

7. Write the homogeneous equation of $\frac{d\ y}{dx} \quad v$

8. Laplace transform of t is ______

9. If $L\{F(t)\} = f(s)$, then $L\{e \quad F(t)\} =$ ______

10. Find $(F * G)\,t$ if $F(t) = 1$, $G(t) = 1$.

11. $L\{e' \sin bt\} -$ ______

12. Show that $(x^2 + y)\,dx + (y^2 + x)\,dy = 0$ is exact.

(12 x = 3 weightage)

Turn over

Answer **all** *questions.*

13. Solve $\frac{dy}{dx} \quad \frac{-y^2}{1-x^2} = 0$

14. **Define a homogeneous differential equation.**

15. **Find the integrating factor of** $(1+xy)\,ydx + (1-xy)\,xdy = 0$.

16. **Determine N (x, y) such that the equation** $(x^3 + xy\ )\,dx + N(x,y)\,dy = 0$ **is exact.**

17. **Find the Laplace transform of cos** ***at.***

18. **Find (F * G)** ***t*** **if** $F(t) = t, G(t) = e^t$.

19. **Determine whether sin** *7x* **is periodic. If so find its fundamental period.**

20. **Find the Laplace transform of** $2e \quad$ **3x 2t.**

21. **Find the Wronskian of sin x and cos x.**

(9 x 1 = 9 weightage)

Answer any **five** *questions from seven.*

22. **Solve** $(x^2 \quad y^2)\frac{dy}{dx} = xy$.

23. **Solve the initial value problem** $\frac{d^2y}{dx^2} \quad 6\frac{dy}{dx} + 25y = 0$, $y(0) = -3$, $y'(0) = -1$.

24. **Transform the equation** $u \ + 2u' + 2u = 0$ **into a system of first order equation.**

25. **If** $\{F(t)\} = f(s)$ **then prove that** $L\{e^{at}F \quad = f(s-a)$.

26. **Find the inverse transform of** $\frac{3s+7}{s^2 \quad 2s-3}$.

27. **Using Convolution property, find** $L\left|\frac{1}{s(s^2+a^2)}\right|$

28. **Solve the boundary value problem** $y'' + 2y = 0$, $y(0) = 1$, $y(\pi) = 0$.

(5 x 2 = 10 weightage)

Answer any two questions.

29. Find the integrating factor and hence solve

$$x^2 y\, dx - (x^3 + y^{-})\,dy = 0.$$

30. Solve by the method of undetermined coefficients

$$\frac{d^2 y}{dx^2} \;2\; \frac{dy}{dx} \quad 3y = 2e^{\cdot x}.$$

31. Solve by the method of variation of parameters

$$\frac{d^{-} y}{dx^2} \; y = \tan x.$$

(2 x 4 = 8 weightage)