

D 50725

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Name.....

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  $\frac{d^3y}{dx^3} + 2\left(\frac{d^2y}{dx^2}\right)^2 - \frac{dy}{dx} + y = 0$ .
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 iff  $B = C$ .
6. Verify that  $\sin x$  is a solution of  $\frac{d^2y}{dx^2} + y = 0$ .
7. Write the homogeneous equation of  $\frac{d^2y}{dx^2} + y = x$ .
8. Laplace transform of  $t$  is \_\_\_\_\_.
9. If  $L\{F(t)\} = f(s)$ , then  $L\{e^{-at}F(t)\} =$  \_\_\_\_\_.
10. Find  $(F * G)t$  if  $F(t) = 1$ ,  $G(t) = 1$ .
11.  $L\{e^{-at} \sin bt\} =$  \_\_\_\_\_.
12. Show that  $(x^2 + y) dx + (y^2 + x) dy = 0$  is exact.

(12 × ¼ = 3 weightage)

Turn over

Answer all questions.

13. Solve  $\frac{dy}{dx} + \sqrt{\frac{1-y^2}{1-x^2}} = 0$ .
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  $(x^3 + xy^2) dx + N(x, y) dy = 0$  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  $2e^{4t} + 3x^{-2t}$ .
21. Find the Wronskian of  $\sin x$  and  $\cos x$ .

(9 × 1 = 9 weightage)

Answer any five questions from seven.

22. Solve  $(x^2 + y^2) \frac{dy}{dx} = xy$ .
23. Solve the initial value problem  $\frac{d^2 y}{dx^2} - 6 \frac{dy}{dx} + 25y = 0, y(0) = -3, y'(0) = -1$ .
24. Transform the equation  $u'' + 2u' + 2u = 0$  into a system of first order equation.
25. If  $\{F(t)\} = f(s)$  then prove that  $L\{e^{at}F(t)\} = f(s-a)$ .
26. Find the inverse transform of  $\frac{3s+7}{s^2-2s-3}$ .
27. Using Convolution property, find  $L^{-1}\left[\frac{1}{s(s^2+a^2)}\right]$ .
28. Solve the boundary value problem  $y'' + 2y = 0, y(0) = 1, y(\pi) = 0$ .

(5 × 2 = 10 weightage)

Answer any **two** questions.

29. Find the integrating factor and hence solve

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

30. Solve by the method of undetermined coefficients

$$\frac{d^2 y}{dx^2} - 2 \frac{dy}{dx} - 3y = 2e^{4x}.$$

31. Solve by the method of variation of parameters

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

(2 × 4 = 8 weightage)