MAR IVANIOS COLLEGE (AUTONOMOUS)
THIRUVANANTHAPURAM

Reg. No. :…… **Name :……**

Fifth Semester B.Sc. Degree Examination, November 2016
First Degree Programme under CBCSS
Core Course: Mathematics – VI
AUMM543: Differential Equations

Time: **3** Hours Max. Marks: **80**

SECTION – A

*Answer **ALL** questions / problems in one or two sentences.*

1. Write the general form of a second order linear differential equation.
2. Define an exact differential equation.
3. Find an exact differential equation whose solution is $u = x^2 - y^2$
4. Find A such that the following equation is exact. $(Ax^2y+2y^2)\,dx+(x^3+4xy)\,dy=0$.
5. Find an integrating factor of $\frac{dy}{dx} + \frac{y}{x^2} = x^2$
6. Solve the equation $y'' - y = 0$
7. Define Euler Cauchy equation.
8. Is the functions $x|x|$ and x^2 are linearly independent or dependent on $0 \leq x \leq 1$?
9. Find the wronskian W (sinx, cosx).
10. Solve $2y'' - 9y' = 0$.

(10 × 1 = 10 Marks)

SECTION – B

*Answer any **EIGHT** questions / problems, not exceeding a paragraph.*

11. Solve the initial value problem $x^2y'' - 2xy' + 2y = 0, y(1) = 3, y'(1) = 2$ if x and x^2 form a basis of solution.
12. Solve $y\,dx - x\,dy + (x^2 + y^2)\,dx = 0$

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13. Solve $2y'' + 3y' + 4y = 0$
14. Solve the initial value problem $\frac{dy}{dx} + 2y = e^{-x}, given\ y(o) = \frac{3}{4}$
15. Solve the initial value problem $y'' + 5y' + 6y = 0$ given y(0)=2 and y'(0)=3
16. Solve $(y - x^2)dx + (x^2 siny - x)dy = 0.$
17. Solve $2x(y^2 + 1)\,dx + (x^4 + 1)\,dy = 0$
18. Solve $(x - 4)y^4\,dx - x^3(y^2 - 3)\,dy = 0$
19. Show that cos (x + y) is an integrating factor of $ydx + [y + tan(x + y)]dy = 0$ and solve.
20. Solve $(D^2 + 2D + 1)y = 0.$
21. Verify that $y_p = e^{-3x} - 3e^x$ is a solution of the differential equation $y'' - y = 8e^{-3x}$ and find a general solution.
22. Find the steady state oscillation of the mass spring system governed by the equation $y'' + 2y' + 5y = -13\ sin3t.$

(8 × 2 = 16 Marks)

SECTION – C

*Short essay type problems : Answer any **SIX** questions.*

23. Solve the initial value problem $(2xcosy + 3x^2y)dx + (x^3 - x^2 siny - y)dy = 0,$ given that y(0) = 2
24. Find an integrating factor and solve $x^2ydx - (x^3 + y^3)dy = 0.$
25. Solve $sec^2x\ tanydx + tanx\ sec^2ydy = 0$
26. Solve $ye^x siny + (ye^x cosy + 1)\frac{dy}{dx} = 0$
27. Solve $\frac{dy}{dx} + \frac{2x+1}{x}y = e^{-2x}$
28. A small body moves on a straight line so that its velocity equals the acceleration. If at t=0 the body's distance from the origin is2meters and its velocity is 2 meters/sec. What is its distance and velocity at t=6sec.
29. Solve $\frac{d^2y}{dx^2} + y$ = cosec x
30. Solve the initial value problem $y'' - 3y' - 4y = 3e^{2x}$ given y(0) = 1 and y'(0) = 0

31. Find a general solution of $(x^2D^2 - 4xD + 6)y = 7x^4 sinx$.

(6 × 4 = 24 Marks)

SECTION – D

*Long essay type problems : Answer any **TWO** questions.*

32. Find the general solution of the differential equation $(x^2 + 1)\frac{d^2y}{dx^2} - 2x\frac{dy}{dx} + 2y = 6(x^2 + 1)^2$, if y = x is a solution of the corresponding homogeneous equation.

33. Using the method of variation of parameters, find the general solution of $\frac{d^2y}{dx^2} + 6\frac{dy}{dx} + 9y = \frac{e^{-3x}}{x^3}$

34. i) Solve $y^2dx + (3xy - 1)dy = 0$

    ii) Solve the initial value problem $(3x + 8)(y^2 + 4)dx - 4y(x^2 + 5x + 6)dy = 0$ Given that y(1) = 2

35. Find the general solution of $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = 2x^2 + e^x + 2xe^x + 4e^{3x}$

(2 × 15 = 30 Marks)

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