



Reg. No. :

Name :

II Semester B.Sc. Hon's (Mathematics) Degree (C.B.C.S.S. – OBE – Regular)
Examination, April 2022
(2021 Admission Only)
2B 08 BMH : ORDINARY DIFFERENTIAL EQUATIONS

Time : 3 Hours

Max. Marks : 60

SECTION – A

Answer **any 4** questions out of 5 questions. **Each** question carries **1** mark :

1. Check whether the differential equation $(x^3 + 3xy^2)dx + (3x^2y + y^3)dy = 0$ is exact or not.
2. What is the general form of a second order linear differential equation ?
3. Define Wronskian of two solutions y_1 and y_2 of a differential equation.
4. Write the characteristic equation of $x^2y''' - 3x^2y'' + 6xy' - 6y = 0$.
5. What is the error of Runge-Kutta fourth order formula for the solution of ordinary differential equations ? (4×1=4)

SECTION – B

Answer **any 6** questions out of 9 questions. **Each** question carries **2** marks :

6. Solve the differential equation $9yy' = 4x = 0$.
7. Solve $y' + 2y = e^x (3 \sin 2x + 2 \cos 2x)$.
8. Solve the differential equation $y'' - y = 0$.
9. Show that the solutions of the differential equation $y'' - 2y' + y = 0$ are linearly independent on any interval.

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10. Solve the differential equation $x^2y'' + 7xy' + 13y = 0$.
11. Solve the differential equation $y^{iv} - 5y'' + 4y = 0$.
12. Write a note on linear system of ordinary differential equations and write its vector equation.
13. What do you mean by initial value problems and boundary value problems ?
14. Using Euler's method, find the value of $y(0.01)$, given that $y' = -y$, $y(0) = 1$. (6×2=12)

SECTION – C

Answer **any 8** questions out of 12 questions. **Each** question carries **4** marks :

15. Solve the differential equation $(2x - 4y + 5)y' + x - 2y + 3 = 0$.
16. Solve the initial value problem $(\sin x \cosh y)dx - (\cos x \sinh y)dy = 0$, $y(0) = 3$.
17. What do you mean by orthogonal trajectories of a given family of curves ? What are the steps to find the orthogonal trajectories of a family of curves ?
18. Find a basis of solutions for the differential equation $x^2y'' - xy + y = 0$.
19. Solve the differential equation $y'' + 0.2y' + 4.01y = 0$, $y(0) = 0$, $y'(0) = 2$.
20. Using the method of variation of parameters, solve the differential equation $y'' + y = \sec x$.
21. Solve $x^2y'' - xy' + y = \log x$.
22. Solve the differential equation $y'''' + 3y'' + 3y' + y = 30e^{-x}$.
23. Convert the differential equation $y'' + 2y' + 0.75y = 0$ into a system of first order ordinary differential equations, write the system into vector form and find the characteristic roots of the coefficient matrix.
24. Using Taylor series method find the value of $y(0.1)$ correct to four decimal places, given that $\frac{dy}{dx} = x - y^2$, $y(0) = 1$.

25. Briefly explain the method of solving ordinary differential equation using Picard's method.

26. Using the modified Euler's method, determine the value of y when $x = 0.1$, given that $y(0) = 1$ and $y' = x^2 + y$. (8×4=32)

SECTION – D

Answer **any 2** questions out of 4 questions. **Each** question carries **6** marks :

27. Find an integrating factor for the equation $2 \sin(y^2)dx + xy \cos(y^2)dy = 0$, $y(2) = \sqrt{\frac{\pi}{2}}$ and hence solve it.
28. Solve the initial value problem $y'' + 2y' + 101y = 10.4e^x$, $y(0) = 1.1$, $y'(0) = -0.9$.
29. Solve the nonhomogeneous Euler-Cauchy equation $x^3y''' - 3x^2y'' + 6xy' - 6y = x^4 \ln x$.
30. Using Runge-Kutta Fourth order formula, find the values of $y(0.1)$ and $y(0.2)$ correct to four decimal places, given that $\frac{dy}{dx} = y - x$, $y(0) = 2$. (2×6=12)