

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-I & II (SPFU) EXAMINATION – SUMMER-2019

Subject Code: MTH002

Date: 010/06/2019

Subject Name: Ordinary Differential Equation

Time: 10:30 AM TO 01:00 PM

Total Marks: 70

Instructions:

1. Attempt any five questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) I. Form the Differential equation from the solution $y = c_1 \cos x + c_2 \sin x$. 03
 II. Verity that $y = e^x(a \cos x + b \sin x)$ is a solution of $y'' - 2y' + 2y = 0$. 04
- (b) I. Solve $2xy \, dx + x^2 \, dy = 0$. 03
 II. Solve the I.V.P. : $xy' + y = 0, y(2) = -2$ 04
- Q.2** (a) Test the exactness and solve 07
 $[(x+1)e^x - e^y]dx - xe^y dy = 0; y(1) = 0$
- (b) I. Find the Differential equation of the orthogonal trajectory to $y = cx^2$ 03
 II. Find the orthogonal trajectories of the family of Cardioids 04
 $r = a(1 + \cos \theta)$, where a is parameter.
- Q.3** (a) Solve the I.V.P. : $\frac{dy}{dx} + y = x; y(0) = 0$ 07
 (b) Solve $xy' = y^2 + y$ 07
- Q.4** (a) Verify that the functions $x^{-\frac{1}{2}}$ and $x^{\frac{3}{2}}$ form a basis of solutions of 07
 $4x^2 y'' - 3y = 0$. Also write general solution of the given equation.
- (b) I. $f(x) = e^x$ and $g(x) = e^{-x}$ are linearly independent or dependent? 02
 II. If $y = e^x(c_1 \cos x + c_2 \sin x)$ find the Wronskian $W(y_1, y_2)$. 02
 III. Find the General Solution of $y'' + y' - 2y = 0$. 03
- Q.5** (a) Solve the I.V.P. $y'' + 4y = 8e^{-2x} + 4x^2 + 2; y(0) = 2, y'(0) = 2$. 07
 (b) Using method of undetermined coefficients, solve $y'' + 4y = 8x^2$. 07
- Q.6** (a) Solve $y'' - 3y' + 2y = e^x$ 07
 (b) Find the roots of the indicial equation to $x^2 y'' + xy' - (2-x)y = 0$ 07
 by Frobenius method.
- Q.7** (a) Find the series solution of $(x^2 + 1)y'' + xy' - xy = 0$ near $x = 0$. 07
 (b) Find the series solution of $y'' = 2y'$ in power of x . 07
