

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-1st / 2nd (SPFU) EXAMINATION- WINTER 2015

Subject Code: MTH002**Date: 19/12/2015****Subject Name: Ordinary Differential Equation****Time: 10:30am to 01:00pm****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) Solve: $(e^{2y} - y \cos xy)dx + (2xe^{2y} - x \cos xy + 2y)dy = 0$. **07**
- (b) 1) Solve: $\frac{dy}{dx} = \frac{y-x}{y+x}$. **07**
- 2) Solve: $x\frac{dy}{dx} + y = \frac{1}{y^2}$.
- Q.2** (a) The population of a town grows at a rate proportional to the population present at time t. The initial population of 500 increase by 15% in 10 years. What will be the population in 30 years? How fast is the population growing at t=30? **07**
- (b) y_1 is a solution of the following differential equation. Use reduction of order formula to find a second solution y_2 . **07**
- $y'' - 4y' + 4y = 0$; $y_1 = e^{2x}$.
- Q.3** (a) Solve: 1) $y'' - 4y' + 5y = 0$ **07**
- 2) $y''' + 3y'' + 3y' + y = 0$
- (b) Solve the given differential equation by undetermined coefficients. **07**
- $y'' - 2y' + 5y = e^x \sin x$
- Q.4** (a) Solve by Variation of parameters method $y'' + y = \sec x$. **07**
- (b) Solve Cauchy-Euler differential equation $x^2 y'' - xy' + y = 2x$. **07**
- Q.5** (a) Solve the given system of differential equation by systematic elimination **07**
- $(D-1)x + (D^2+1)y = 1$
- $(D^2-1)x + (D+1)y = 2$
- (b) Solve: $y'' = 2x(y')^2$. **07**
- Q.6** (a) A mass weighing 2 pounds stretches a spring 6 inches. At t = 0 the mass is released from a point 8 inches below the equilibrium position with an upward velocity of $\frac{4}{3}$ ft/s. Determine the equation of motion. **07**
- (b) Find power series solution of $y'' + xy = 0$ near $x = 0$. **07**
- Q.7** (a) Find power series solution of $3xy'' + y' - y = 0$. **07**
- (b) Find power series solution of $9x^2 y'' + 9x^2 y' + 2y = 0$. **07**
