



## Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058,  
India

(Autonomous College Affiliated to University of Mumbai)

### End Semester Examination

August 2021

**Max. Marks: 60**

**Class: FE**

**Course Code: MA201**

**Name of the Course: Differential Equations and Complex Analysis**

**Duration: 2 hours**

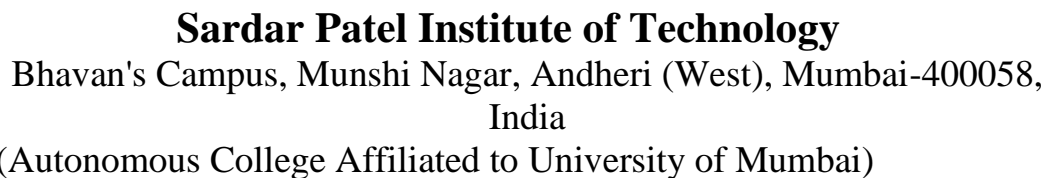
**Semester: II**

**Branch: ETRX/EXTC/IT/COMPS**

**Instructions:**

- (1) All Questions are Compulsory
- (2) Assume suitable data if necessary
- (3) Full working to be shown
- (4) Start each section on a fresh page.

Question No.	Section1	Max. Marks	CO
<b>Q.1</b>			1
(A)	Solve: $2(1 + x^2\sqrt{y})ydx + (x^2\sqrt{y} + 2)xdy = 0$ <b>OR</b> Solve: $\tan y \frac{dy}{dx} + \tan x(1 - \cos y) = 0$	5	
(B)	Using Euler's method find the approximate value of y at x= 0.1 (exact up to 4 decimal places) for the differential equation $\frac{dy}{dx} = x - y^2$ , with initial conditions y(0)=1 in 5 steps.	5	
<b>Q.2</b>			2
(A)	Solve the system of differential equations $\frac{dx}{dt} = 4x - 3y - 4t^2 + 5t$ $\frac{dy}{dt} = 6x - 7y - 6t^2 + 7t + 1$	7	
(B)	Solve: $\left(\frac{d^2}{dx^2} - \frac{2}{x^2}\right)\left(\frac{d}{dx} + \frac{1}{x}\right)y = \cos(\log x)$	8	
<b>Q.3</b>			3
(A)	The current 'i' in a circuit, containing a resistance R, and a condenser of capacity C, and connected to a constant emf E is given by, $Ri + \frac{q}{C} = \frac{E}{R}$ . Find the charge 'q' if given that q=0 when t=0.	5	



<b>Q.4</b>	<b>Section2</b>		4
(A)	List down all the roots of $x^6 - 1 = 0$ . Hence, find the roots of $x^4 + x^2 + 1 = 0$ that are common to $x^6 - 1 = 0$ .	6	
(B)	If $\tanh(\alpha + i\beta) = x + iy$ prove that, (i) $x^2 + y^2 + 1 = 2x \coth 2\alpha$ (ii) $x^2 + y^2 + 2y \cot 2\beta = 1$ <b>OR</b> If $\cos(\theta + i\phi) = re^{i\alpha}$ prove that, (i) $r^2 = \frac{1}{2}(\cosh 2\phi + \cos 2\theta)$ (ii) $\tan \alpha = -\tan \theta \tanh \phi$	6	
(C)	If $\sqrt[n]{i} = \alpha + i\beta$ prove considering the principal value, (i) $\alpha^2 + \beta^2 = e^{\frac{-\pi\beta}{2}}$ (ii) $\tan\left(\frac{\alpha\pi}{4}\right) = \frac{\beta}{\alpha}$	6	
<b>Q.5</b>			5
(A)	Using Milne Thompson's method, construct an analytic function $f(z) = u + iv \text{ if } u = \frac{\sin x + \sin y}{\cosh y - \cos x}$	6	
<b>Q.6</b>			6
(A)	Evaluate $\oint (z^3 + z + 1 - 2\bar{z}) dz$ over the curve C, where C is the circle $x^2 + y^2 = 2$ . <b>OR</b> Evaluate $\oint \frac{z^2 + 1}{(z-1)^2(z-2)} dz$ over the curve $ z - 2  = 2$ .	6	
	<b>ALL THE BEST 😊</b>		