

Seat No.: \_\_\_\_\_

Enrolment No. \_\_\_\_\_

## GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER-I & II(NEW)EXAMINATION – SUMMER 2022

Subject Code:3110015

Date:22-08-2022

Subject Name:Mathematics - 2

Time:10:30 AM TO 01:30 PM

Total Marks:70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

	Marks
<b>Q.1</b> (a) Find the Laplace transform of $t^2 e^{-3t}$ .	03
(b) Define conservative vector field and potential function.	04
(c) Solve $y''' - 3y'' + 3y' - y = 4e^x$ using the method of undetermined coefficients.	07
<b>Q.2</b> (a) Find the divergence of $F = (x^2 - y)\mathbf{i} + (xy - y^2)\mathbf{j}$ .	03
(b) Find Fourier cosine integral of $f(x) = e^{-kx} (x > 0, k > 0)$	04
(c) Integrate $f(x, y, z) = 3x^2 - 2y + z$ over the line segment $C$ joining the origin to the point $(2,2,2)$ .	07
<b>OR</b>	
(c) Write Green's theorem. Evaluate the integral $\oint_C \{xydy - y^2dx\}$ where $C$ is the square cut from the first quadrant by the lines $x = 1$ and $y = 1$ .	07
<b>Q.3</b> (a) Obtain convolution of $t$ and $e^t$ .	03
(b) Find the Laplace transform of $\frac{\cos at - \cos bt}{t}$ .	04
(c) Solve the initial value problem $y'' - y' - 2y = 0, y(0) = 1, y'(0) = 0$ using Laplace transform.	07
<b>OR</b>	
<b>Q.3</b> (a) Find the inverse Laplace transform of $\frac{s-4}{s^2-4}$ .	03
(b) State second shifting theorem and find the inverse Laplace transform of the function $\frac{se^{-\pi s}}{s^2+1}$ .	04
(c) State convolution theorem and using it obtain the inverse Laplace transform of $\frac{1}{s(s^2+4)}$ .	07
<b>Q.4</b> (a) Solve $\frac{dy}{dx} - 2y = 4 - x$ .	03
(b) Solve $p^2 + 2p \cot x = y^2$ .	04
(c) Solve $y'' + 4y = 4 \tan 2x$ using the method of variation of parameters.	07
<b>OR</b>	
<b>Q.4</b> (a) Find particular solution of $y'' - 2y' + y = \cos 3x$ .	03
(b) Solve $x^2 y'' - 3xy' + 4y = 0$	04

- (c) Solve the initial value problem **07**  
 $y''' + y' = 0,$   
 $y(0) = 0, y'(0) = 1, y''(0) = 2$
- Q.5** (a) Write Legendre's and Bessel's differential equations. **03**  
 (b) Solve the differential equation **04**  
 $(y \cos x + 2xe^y) + (\sin x + x^2 e^y - 1)y' = 0$
- (c) Find the power series solution of the equation  $(x^2 + 1)y'' + xy' - xy = 0$  in powers of  $x$ . **07**
- OR**
- Q.5** (a) Write Legendre polynomials of degree one and two. **03**  
 (b) Solve  $y = 2px + p^2y$ . **04**  
 (c) Solve  $x(x - 1)y'' + (3x - 1)y' + y = 0$  about  $x = 0$  using Frobenius method. **07**

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