Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III (Old) EXAMINATION – WINTER 2019

Subject Code: 130002 **Date: 22/11/2019**

Subject Name: Advanced Engineering Mathematics

Time: 02:30 PM TO 05:30 PM **Total Marks: 70**

Instructions:

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

Q.1 **(a)** (i) Solve $ye^x\,dx + (2y + e^x)\,dy = 0$ **03**

(ii) Solve $(x+1)\frac{dy}{dx} - y = e^{3x}(x+1)^2$ **04**

(b) Obtain Fourier series of $f(x) = x^2$ in the interval$(0, 4)$. **07**

Q.2 **(a)** (i) Use method of Undetermined coefficients and find general solution of $y'' + 10y' + 25y = e^{-5x}$ **07**

(b) Find general solution of $(D^2 + 2D - 35)y = 37\sin 5x$ **07**

OR

(b) Solve by Variation of parameter method $(D^2 + 9)y = tan3x$ **07**

Q.3 **(a)** Find Fourier series of $f(x) = e^{ax}$ in $(0, 2\pi), a > 0$ **07**

(b) Find Fourier series of $f(x) = \begin{cases} x & , 0 \le x \le 2 \\ 4 - x & , 2 \le x \le 4 \end{cases}$ **07**

OR

Q.3 **(a)** Find the Series solution of $y'' - 2y' = 0$ **07**

(b) Express the function $f(x) = \begin{cases} \sin x\,, & 0 \le x \le \pi \\ 0\,, & x > \pi \end{cases}$ as a Fourier sine integral and show that **07**

$$\int_0^\infty \frac{\sin\omega x \sin\pi\omega}{1-\omega^2}\,d\omega = \frac{\pi}{2}\sin x \quad , \quad 0 \le x \le \pi$$

Q.4 **(a)** (i) Find Laplace transform of $e^t\left(1+\sqrt{t}\right)^4$ **03**

(ii) Find the inverse Laplace transform of $\frac{2s+2}{s^2+2s+10}$ **04**

(b) State Convolution theorem and using it find inverse Laplace transform of $\frac{1}{(s-2)(s+2)^2}$ **07**

OR

Q.4 **(a)** (i) Find Laplace transform of $e^{-3t}\,u(t-2)$ **03**

(ii) Find inverse Laplace transform of $\frac{e^{-2s}}{(s+4)^3}$ **04**

(b) Solve initial value problem using Laplace transform method **07**

$$y'' - 3y' + 2y = 12e^{-2t}\,, \quad y(0) = 2, y'(0) = 6$$

Q.5 **(a)** (i) Form Partial differential equation for the equation **03**

$z = ax + by + ct$

(ii) Find Laplace transform of $f(t) = \begin{cases} cos\,t & , 0 < t < 2\pi \\ 0 & , \ t > 2\pi \end{cases}$ **04**

(b) Solve $\frac{\partial^2 z}{\partial x^2} + 3\frac{\partial^2 z}{\partial x\,\partial y} + 2\frac{\partial^2 z}{\partial y^2} = x + y$ **07**

OR

Q.5 **(a)** Find the Series solution of $4xy'' + 2y' + y = 0$ **07**

(b) Using method of Separation of variables solve $\frac{\partial u}{\partial x} = 4\frac{\partial u}{\partial y}$ given that $u(0, y) = 8\,e^{-3y}$ **07**

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