

# 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  $(D^2 + 9)y = \tan 3x$  **07**

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

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

**OR**

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

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

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

- Q.4** (a) (i) Find Laplace transform of  $e^t(1 + \sqrt{t})^4$  **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  $y'' - 3y' + 2y = 12e^{-2t}$ ,  $y(0) = 2, y'(0) = 6$  **07**

- Q.5** (a) (i) Form Partial differential equation for the equation  $z = ax + by + ct$  **03**

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

(b) Solve  $\frac{\partial^2 z}{\partial x^2} + 3 \frac{\partial^2 z}{\partial x \partial y} + 2 \frac{\partial^2 z}{\partial y^2} = x + y$  **www.FirstRanker.com**

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**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 **07**  
 $u(0, y) = 8 e^{-3y}$

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