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   07
          $y'' + 10y' + 25y = e^{-5x}$

(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   07
show that
$$\int_0^\infty \frac{\sin \omega x \sin \pi\omega}{1 - \omega^2}\, d\omega = \frac{\pi}{2}\sin x \ , \quad 0 \le x \le \pi$$

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   07
$\frac{1}{(s-2)(s+2)^2}$

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 $\dfrac{\partial^2 z}{\partial x^2} + 3\dfrac{\partial^2 z}{\partial x\,\partial y} + 2\dfrac{\partial^2 z}{\partial y^2} = x + y$ **07**

OR

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

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

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