Seat No.: Enrolment No.
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## GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-III(OLD) EXAMINATION - SUMMER 2019

Subject Code: 130002 Date: 30/05/2019

**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 
$$3e^x \tan y \, dx + (1 - e^x) \sec^2 y \, dy = 0$$
 03

(ii) Solve y'- 
$$(1+3 x^{-1})y = x+2$$
;  $y(1) = e-1$ 

- **(b)** Find the Power series solution of the differential equation y'' = y'. **07**
- **Q.2** (a) Using the method of separation of variables solve  $u_{xx} = 16 u_y$ . 07
  - (b) Find the series solution of the differential equation by Frobenius method 07

$$x\frac{d^2y}{dx^2} + \frac{dy}{dx} - y = 0$$

- (b) (i) Solve  $y'' + 4y = 8 \cos 2x$ , y(0) = 0, y'(0) = 2(ii) Solve  $y'' 4y' 12y = 7 e^{-7x}$  by method of undetermined coefficients. 03
- (a) Find the Fourier series for the function  $f(x) = x^2 + x$ ,  $-\pi \le x \le \pi$ . **Q.3** 07
  - (b) Find the Fourier series of the function 07

$$f(x) = \begin{cases} -\pi, & 0 < x < \pi \\ x - \pi, & \pi < x < 2\pi \end{cases}$$

OR

- Find the Fourier series with period 3 to represent  $f(x) = 2x x^2$  in the range **Q.3 07** 
  - (b) Find the harrange Fourier cosine series of the function f(x) = c x in interval **07** (0, c) was period 2c.
- (i) Find the Laplace transform of  $e^{-t} (4t^3 + 3\cos 2t + 2e^{-2t})$ 03 **Q.4** 
  - (ii) Prove that 04

$$L(sinat) = \frac{a}{s^2 + a^2}$$
 and  $L(cosat) = \frac{s}{s^2 + a^2}$ 

s > 0, where  $\alpha$  is a constant.

**(b)** 

Find the Inverse Laplace transform of
(1) 
$$\frac{s+3}{(s^2+1)(s^2+9)}$$
 (2)  $\frac{2s+3}{s^2-2s+5}$ 

OR

(a) (i) Find the Laplace transform of

$$e^{-2t} \int_0^t t \cos t \, dt$$

(ii) Find the Inverse Laplace transform of

$$\frac{1+e^{-\frac{\pi}{2}s}}{s^2+4}$$

**07** 

03

04

04

- (b) Using Laplace transform solve the differential equation y'' + 6y = 1, y(0) = 2, y'(0) = 0
- Q.5 (a) (i) Form Partial differential equation by eliminating the arbitrary function from the equation 03

$$z = y^2 + 2f\left(\frac{1}{x} + logy\right)$$

- (ii) Define the following: (1) Beta function (2) Dirac's Delta Function 04
- (b) Express the function as a Fourier Integral  $f(x) = \begin{cases} 1, & |x| \le 1 \\ 0, & [x] > 1 \end{cases}$

## OR

- Q.5 (a) (i) Solve: p + q = pq (ii) Solve:  $x (y^2 z^2) p + y (z^2 x^2) q = z(x^2 y^2)$ .

  (b) Solve the following: 07
  - Solve the following: (i)  $\frac{\partial^3 z}{\partial x^3} - 4 \frac{\partial^3 z}{\partial x^2 \partial y} + 4 \frac{\partial^3 z}{\partial x \partial y^2} = 2\sin(3x + 2y)$ (ii)  $(D - D' - 1)(D - D' - 2)z = e^{2x - y}$ 
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