

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

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

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-III (NEW) - EXAMINATION – SUMMER 2018****Subject Code:2130002****Date:16/05/2018****Subject Name:Advanced Engineering Mathematics****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.

**Q.1 (a)** Solve  $\frac{dy}{dx} = e^{x-y} + x^2 e^{-y}$  by variable separable method. **03**

**(b)** Solve  $\frac{dy}{dx} + y \sin x = e^{\cos x}$  **04**

**(c)** State convolution theorem and hence find  $L^{-1}\left[\frac{1}{(s^2 + 4)^2}\right]$  **07**

**Q.2 (a)** Solve  $y'' - 3y' + 2y = e^{3x}$  **03**

**(b)** Find Fourier series for  $f(x) = x^2$ ;  $-\pi \leq x \leq \pi$  **04**

**(c)** Find Fourier series in the interval  $(0, 2\pi)$  if **07**

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

and hence show that  $\sum_{n=1}^{\infty} \frac{1}{(2n+1)^2} = \frac{\pi^2}{8}$

**OR**

**(c)** Find the series solution of  $y'' + x^2 y = 0$  about an ordinary point  $x = 0$  **07**

**Q.3 (a)** Solve  $y''' - 6y'' + 11y' - 6y = 0$  **03**

**(b)** Solve  $(D^2 + 9)y = \cos 4x$  **04**

**(c)** Solve  $y'' + 4y = 4 \tan 2x$  by method of variation parameter. **07**

**OR**

**Q.3 (a)** Find  $L^{-1}\left[\frac{1}{(s+1)(s+2)}\right]$  **03**

**(b)** Solve  $y'' - 2y' + 5y = 5x^3 - 6x^2 + 6x$  by method of undetermined coefficients. **04**

**(c)** Find the series solution of  $8x^2 y'' + 10xy' - (1+x)y = 0$  **07**

**Q.4 (a)** Solve  $(x^4 + y^4)dx - xy^3 dy = 0$  **03**

**(b)** Express  $\sin x$  as cosine series in  $0 < x < \pi$  **04**

**(c)** Find Fourier series for  $f(x) = e^{ax}$  in  $(0, 2\pi)$ ;  $a > 0$  **07**

**OR**

**Q.4 (a)** Find  $L[\cos^2 t]$  **03**

(b) Find  $L[e^{2t} \sin 3t]$  04

(c) Solve  $y''+y = \sin 2t$ ; with  $y(0) = 2, y'(0) = 1$  by using Laplace transform. 07

**Q.5** (a) Solve  $p^2 + q^2 = 1$  03

(b) Solve  $xp + yq = 3z$  04

(c) Solve  $\frac{\partial^2 z}{\partial x^2} - 4\frac{\partial z}{\partial x \partial y} + 4\frac{\partial^2 z}{\partial y^2} = e^{2x+3y}$  07

**OR**

**Q.5** (a) Solve  $p^2 - q^2 = x - y$  03

(b) Solve  $\frac{\partial^3 z}{\partial x^2 \partial y} = \cos(2x + 3y)$  04

(c) Solve by Charpit's method  $p = (z + qy)^2$  07

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