Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III EXAMINATION – SUMMER 2016

Subject Code:130002 **Date:07/06/2016**

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)** (i) Solve $xy\frac{dy}{dx} = 1 + x + y + xy$ **07**

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

(b) Find the power series solution about x=0 of $y'' = 2y'$ **07**

Q.2 **(a)** Using the method of separation of variables solve **07**

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$$

(b) (i) Solve $(D^3 + 4D)y = sin2x.$ **07**

(ii) Solve $(D^2 + D)y = \frac{1}{1+e^x}$

OR

(b) (i) Solve $(D^2 - 6D + 9)y = x^2e^{3x}.$ **07**

(ii)Solve $(D^2 - 4)y = x^2$

Q.3 **(a)** Find Fourier series for **07**

$$f(x) = \pi x, 0 \le x \le 1$$
$$= \pi(2 - x), 1 \le x \le 2.$$

(b) Obtain Fourier series for $f(x) = e^{-x}$ in interval $0 < x < 2\pi.$ **07**

OR

Q.3 **(a)** Find Fourier series for **07**

$$f(x) = 1 + \frac{2x}{\pi}, -\pi \le x \le 0$$
$$= 1 - \frac{2x}{\pi}, 0 \le x \le \pi.$$

(b) Obtain half range sineFourier series for $f(x) = e^x$ in interval $0 < x < 1$ **07**

Q.4 **(a)** Using Laplace transform solve the differential equation **07**

$\frac{d^2x}{dt^2} + 2\frac{dx}{dt} + 5x = e^{-t}$ sint . where $x(0) = 0, x'(0) = 1$

Using convolution theorem find $L^{-1}(\frac{1}{(s^2+a^2)^2})$.

(b) Using convolution theorem find $L^{-1}(\frac{1}{(s^2+a^2)^2}$ **07**

OR

Q.4 **(a)** i) Find $L\ (\frac{t-sin5t}{t})$. **07**

(ii) Find $L\ (t^2cos^2 2t)$.

(b) (i) Find $L^{-1}(\frac{1-3s}{s^2+8s+21})$. **07**

(ii) Find $L^{-1}\{\log(\frac{s+a}{s+b})\}$

Q.5 **(a)** (i) Define (1) Heaviside's unit step function (2) Signum function. **07**

(ii) Form partial differential equation for $z = f(ax+y) + g(ax-y)$

(b) Find the fourier transform of f(x)=$\frac{1}{x}$ **07**

OR

Q.5 **(a)** (i) Solve $x^2(y-z)p + y^2(z-x)q = z^2(x-y)$ **07**

(ii)Find the complete integral of $p^2 = q + x$

(b) (i) Solve $\frac{\partial^2 z}{\partial x^2} + z = 0$ given that when $x = 0, z = e^y$ and $\frac{\partial z}{\partial x} = 1$ **07**

(ii) Using Charpit's method solve $z = px + qy + p^2 + q^2$