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 $(D^2 - 6D + 9)y = x^2 e^{3x}$.   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 $L\ (t^2 cos^2 2t)$.

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

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

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 $f(x)=\dfrac{1}{x}$ 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 $\dfrac{\partial^2 z}{\partial x^2} + z = 0$ given that when $x = 0, z = e^y$ and $\dfrac{\partial z}{\partial x} = 1$ 07
(ii) Using Charpit's method solve $z = px+qy+p^2+q^2$