

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-III(OLD) • EXAMINATION – WINTER 2016****Subject Code:130001****Date:30/12/2016****Subject Name:Mathematics-3****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) (1) Solve: $y' = (e^x + 3x^2)e^{-y}$ 03
 (2) Find the solution of differential equation 04
 $ye^x dx + (2y + e^x)dy = 0$, where $y(0) = -1$.
- (b) Solve the equation $y'' + y = 0$ by the power series method. 07
- Q.2** (a) (1) Solve $y'' - 3y' + 2y = e^{3x}$ 03
 (2) Find the general solution of the equation $y''' - 6y'' + 11y' - 6y = e^{-x}$. 04
- (b) Solve by method of separation of variable $\frac{\partial u}{\partial x} = 4 \frac{\partial u}{\partial y}$ 07
- OR**
- (b) Find the series solution of $y'' = y'$. 07
- Q.3** (a) Find the Fourier Series of $f(x) = x + |x|$, $-\pi < x < \pi$ 07
 (b) Find the Fourier Series of $f(x) = \begin{cases} -\pi; & -\pi < x < 0 \\ x; & 0 < x < \pi \end{cases}$ 07
- OR**
- Q.3** (a) Find the Fourier Series of $f(x) = \begin{cases} 0; & -1 \leq x \leq 0 \\ x; & 0 \leq x \leq 1 \end{cases}$ 07
 (b) Express $f(x) = 1 - x$, $0 < x < 1$ as a half- range cosine series. 07
- Q.4** (a) (1) Show that: $L(\sin at) = \frac{a}{s^2 + a^2}$ 03
 (2) Find the Laplace Transforms of $e^{3t} \cos 2t$. 04
- (b) Evaluate: (1) $L^{-1} \left\{ \frac{s}{(s+1)^2 + 9} \right\}$ (2) $L^{-1} \left\{ \frac{3s^2 + 2}{(s+1)(s+2)(s+3)} \right\}$ 07
- OR**
- Q.4** (a) Using Laplace transforms solve the initial value problem 07
 $y'' + y = \sin 2t$, $y(0) = 2$, $y'(0) = 1$
- (b) If $L\{f(t)\} = F(s)$ then $L\{t^n f(t)\} = (-1)^n \frac{d^n}{ds^n} [F(s)]$, where $n = 1, 2, 3, \dots$.
 Also find $L\{t^2 \cosh t\}$. 07
- Q.5** (a) (1) Form partial differential equation by eliminating the arbitrary function 03
 $z = xy + f(x^2 + y^2)$.
- (2) Solve $y^2 p - xyq = x(z - 2y)$ 04
- (b) (1) Solve $p(1 + q) = qz$ 03

(2) Solve $x^2 p^2 + y^2 q^2 = z^2$

04

OR

Q.5 (a) (1) Define the following terms (i) Dirac Delta function (ii) Gamma function

04

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

03

(b) Using Fourier integral show that $\int_0^{\infty} \frac{1 - \cos \pi \lambda}{\lambda} \sin x \lambda d\lambda = \begin{cases} \pi/2 & ; \text{if } 0 < x < \pi \\ 0 & ; \text{if } x > 0 \end{cases}$

07
