

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-III (OLD) - EXAMINATION – SUMMER 2017

Subject Code: 130002

Date: 29/05/2017

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)** 1) Solve $(e^y - ye^x)dx + (xe^y - e^x)dy = 0$ **03**
2) Solve $y' + (x + 1)y = e^{x^2}y^3$, $y(0) = 0.5$ **04**
(b) Find the series solution of $y'' + y = 0$. **07**
- Q.2 (a)** Using the method of separation of variables solve $2\frac{\partial u}{\partial x} = \frac{\partial u}{\partial t} + u$, $u(x, 0) = 4e^{-3x}$. **07**
(b) Find the series solution of the differential equation $3xy'' + 2y' + y = 0$ **07**
- OR**
- (b)** 1) Solve $y''' + y' = 0$ **03**
2) Solve $y''' + 3y'' + 3y' + y = 30e^{-x}$ by the method of undetermined coefficients. **04**
- Q.3 (a)** Find the Fourier series of $f(x) = \pi - |x|$, $-\pi < x < \pi$, $f(x + 2\pi) = f(x)$. **07**
(b) Find the Fourier series of $f(x) = e^{-4x}$, $-\pi < x < \pi$, $f(x + 2\pi) = f(x)$. **07**
- OR**
- Q.3 (a)** Find the Fourier series of $f(x) = x + \pi$, $-\pi < x < \pi$ and $f(x + 2\pi) = f(x)$. **07**
(b) Find the Fourier series of $f(x) = \begin{cases} 2 & ; \text{if } -2 < x < 0 \\ 0 & ; \text{if } 0 < x < 2 \end{cases}$ $p = 4$ **07**
- Q.4 (a)** 1) Show that $L\{\sin at\} = \frac{a}{s^2 + a^2}$. **03**
2) Prove that if $L\{f(t)\} = F(s)$ then $L\left\{\frac{f(t)}{t}\right\} = \int_s^\infty F(s)ds$ **04**
(b) Evaluate
1) $L\{t \sin at\}$. **03**
2) $L^{-1}\left\{\frac{15}{s^2 + 4s + 29}\right\}$ **04**
- OR**
- Q.4 (a)** Solve $y'' - y = t$, $y(0) = 1$, $y'(0) = 1$ by Laplace transforms method. **07**
(b) Evaluate
1) $L\left\{\frac{1 - \cos 2t}{t}\right\}$
2) $L^{-1}\left\{\frac{e^{-2\pi s} - e^{-8\pi s}}{(s^2 + 1)}\right\}$ **07**
- Q.5 (a)** 1) Form the partial differential equation from $z = f(x + y + z, x^2 + y^2 + z^2) = 0$. **03**
2) Define (a) Beta function (b) Heaviside's function. **04**
(b) Find the Fourier integral representation of the function $f(x) = \begin{cases} 1 & ; \text{if } |x| < 1 \\ 0 & ; \text{if } |x| > 1 \end{cases}$ **07**
- OR**
- Q.5 (a)** 1) Solve $\frac{\partial^2 z}{\partial x^2} = z$. **03**
2) Form the partial differential equation from $z = xy + f(x^2 + y^2)$. **04**
(b) 1) Solve $p^2 + q^2 = x - y$ **03**
2) Solve $(y + z)p + (z + x)q = x + y$ **04**
