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 $f(x) = \begin{cases} 2 & ; if -2 < x < 0 \\ 0 & ; if\ 0 < x < 2 \end{cases}\ p = 4$ **07**

Q.4 **(a)** 1) Show that $L\{sinat\} = \frac{a}{S^2+a^2}$. **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) $L\{tsinat\}$. **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 **07**

1) $L\left\{\frac{1-cos2t}{t}\right\}$

2) $L^{-1}\left\{\frac{e^{-2\pi S} - e^{-8\pi S}}{(S^2+1)}\right\}$

Q.5 **(a)** 1) Form the partial differential equation from **03**

$z = f(x+y+z,\ x^2+y^2+z^2) = 0$. **04**

2) Define (a) Beta function (b) Heaviside's function.

(b) Find the Fourier integral representation of the function $f(x) = \begin{cases} 1 & ; if\ |x| < 1 \\ 0 & ; if\ |x| > 1 \end{cases}$. **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**

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