Enrollment No:-__________ Exam Seat No:-_______

C.U.SHAH UNIVERSITY

Summer-2015

Subject Code: 4TE03EMT1 Subject Name: Engineering Mathematics - III

Course Name: B.Tech Date :4/5/2015

Semester:3 Marks: 70

Time:02:30To5:30

Instructions:

1) Attempt all Questions of both sections in same answer book/Supplementary.
2) Use of Programmable calculator & any other electronic instrument prohibited.
3) Instructions written on main answer book are strictly to be obeyed.
4) Draw neat diagrams & figures (if necessary) at right places.
5) Assume suitable & perfect data if needed.

SECTION - I

Q-1 (A) Define: Laplace Transform. [01]

(B) Find $L\{t^7\}$ [02]

(C) State and prove first shifting theorem. [02]

(D) Obtain Newton-Raphson formula to find $\frac{1}{N}$ where N is positive integer. [02]

Q-2 (A) Obtain Fourier series for 2π periodic function $f(x) = \begin{cases} -\pi & ;\ 0 < x < \pi \\ x - \pi & ;\ \pi < x < 2\pi \end{cases}$ [07]

Hence, deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \frac{1}{7^2} + \cdots = \frac{\pi^2}{8}$

(B) Obtain Fourier series up to first harmonic for the following table: [07]

x	0	$\frac{\pi}{6}$	$\frac{2\pi}{6}$	$\frac{3\pi}{6}$	$\frac{4\pi}{6}$	$\frac{5\pi}{6}$
y	0	9	14	17	18	11

OR

4-5

Q-3	(A)	Expand f(x)=e^x as a Fourier series in the interval (- a,a).	[07]
	(B)	Find a root of $x^3 - 2x - 5 = 0$ correct to three decimal places, using Bisection method.	[07]
Q-4	(A)	Find $L(te^t sin2tcost)$.	[05]
	(B)	Find a real root of the equation $\cos x = 3x - 1$ correct to three decimal places by using Newton-Raphson method.	[05]
	(C)	(i) Find $L\{ t^5 e^{5t}\}$ (ii) Find $L^{-1}\left\{\frac{1}{(s^2+1)(s-1)}\right\}$	[04]

OR

Q-5	(A)	Find a root of $xe^x - 2 = 0$ correct to two decimal places, using Regula-Falsi method.	[05]
	(B)	By using the method of Laplace transform, solve $(D^3 + 3D + 2)y = 1 - e^{2t}, y(0) = 1 \, and \, y'(0) = 0.$	[05]
	(C)	Find $L^{-1}\left[\frac{s+1}{(s-2)(2s+1)(s-3)}\right]$.	[04]

SECTION - II

Q-1	(A)	Find order and degree of differential equation $\left(\frac{d^2y}{dx^2}\right)^5 - 4\left(\frac{dy}{dx}\right)^2 + 2y = 0$	[01]
	(B)	Find the complimentary function of $(D^2 + 16)y = xsinx$	[02]
	(C)	Find the particular integral of $(D - 3)y = e^{5x}$	[02]
	(D)	Form the differential equation by eliminating the arbitrary constants from the equation $z = ax + by$.	[02]

4-5

Q-2 (A) Solve the differential equation $(D^2 + 2D + 1)y = 4sin\, 2x$ [05]

(B) Solve $(D^2 + 3D + 2)y = e^{e^x}$ [05]

(C) Solve the differential equation $\frac{d^2y}{dx^2} + y = cosecx$ using method of variation of parameters. [04]

OR

Q-3 (A) Solve $(D^2 + 4D + 4)y = \frac{e^{-2x}}{x^2}$. [05]

(B) Solve $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} = \frac{12logx}{x^2}$. [05]

(C) Solve $(D^2+1)y = secx$. [04]

Q-4 (A) Solve $yz\frac{\partial z}{\partial x} + xz\frac{\partial z}{\partial y} = yz$. [05]

(B) Solve $\frac{\partial^2 z}{\partial y^2} = z$ if $y = 0, z = e^x$ and $\frac{\partial z}{\partial y} = e^{-x}$. [05]

(C) Solve $\frac{\partial^2 z}{\partial x \partial y} = \cosh x \sin y$. [04]

OR

Q-5 (A) Using method of separation of variables, solve [05]

$\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u$, where $u(x, 0) = 6e^{-3x}$.

(B) Obtain three possible solutions of the wave equation $\frac{\partial^2 y}{\partial t^2} = c^2\frac{\partial^2 y}{\partial x^2}$. [05]

(C) Solve $\frac{\partial^2 u}{\partial x^2} - 4\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 0$. [04]