# C.U.SHAH UNIVERSITY Winter Examination-2015

# Subject Name : Engineering Mathematics - III

	Subject Code :4TE03EMT1											Branch : B.Tech (All)				
	Semester Instructio	<b>r : 3</b> ons:	Date	e :01/2	12/201	15	Time	:2:30	То 5:3	0	Mar	ks :70	)			
	<ul> <li>(1) U</li> <li>(2) I</li> <li>(3) I</li> <li>(4) A</li> </ul>	<ol> <li>Use of Programmable calculator &amp; any other electronic instrument is prohibited.</li> <li>Instructions written on main answer book are strictly to be obeyed.</li> <li>Draw neat diagrams and figures (if necessary) at right places.</li> <li>Assume suitable data if needed.</li> </ol>														
Q-1	a)	Attemp State D	ot the irichle	<b>follov</b> et'scor	<b>ving c</b> nditio	<b>juesti</b> ns for	s <b>tions:</b> for Fourier series.								( <b>14</b> ) (02)	
	b)	Find La	Find Laplace transform of $L(\cos h \ at \sin at)$ .													
	c)	State se	cond	shiftir	ng the	orem f	for Lap	lace tra	ansform	n.					(02)	
	d)	Elimina	Eliminate the arbitrary function from the equation $z = xy + f(x^2 + y^2)$ .													
	e)	Define Transcendental equation and give an example of it.														
	<b>f</b> )	Write th	Write the convergence criteria of Newton – Raphson method.													
	<b>g</b> )	Find P.I. of $(D + 1)^2 y = e^{-x}$ .														
Attempt any four questions from Q-2 to Q-8 Q-2 Attempt all questions													(14)			
C	a)	Find the Fourier series of the function $f(x) = \begin{cases} -k & \text{if } -\pi < x < 0 \\ k & \text{if } 0 < x < \pi \end{cases}$ with $f(x + 2\pi) = f(x)$													(05)	
	b)	Find inverse Laplace transform of $\frac{4s+5}{(s-1)^2(s+2)}$ . (05)														
	c)	Find Laplace transform of (a) $t^2 \sin 4t$ (b) $\frac{\sin t}{t}$ . (6)													(04)	
Q-3	a)	Attempt all questions a) Solve $\frac{d^2x}{dt^2} + 2\frac{dx}{dt} + 5x = e^{-t} \sin t$ , $x(0) = 0$ , $x'(0) = 1$ .												(14) (07)		
	b)	b) Determine the Fourier series up to and including the second harmonic to (0 represent the periodic function $y = f(x)$ defined by the table of values given below. $f(x) = f(x + 2\pi)$													(07)	
		f(x)	0.5	0.8	1.4	2.0	1.9	1.4	1.2	1.4	1.1	0.5	0.3	0.4		

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#### Q-4 Attempt all questions

(14)

(14)

(14)

- Using Laplace transform solve  $\ddot{x} + 4\dot{x} + 13x = 2\delta(t)$ , where at t = 0, a) (05) x(0) = 2 and  $\dot{x}(0) = 0$ . Find Fourier series of  $f(x) = \begin{cases} 0 & \text{if } 0 < x < l \\ a & \text{if } l < x < 2l \end{cases}$  with f(x + 2l) = f(x). (05)b) Express f(x) = c - x when 0 < x < c as a half – range cosine series with period **c**) (04) 2c. Attempt all questions (14) Solve:  $\frac{d^3x}{dt^3} - 3 \frac{d^2x}{dt^2} + 9 \frac{dx}{dt} - 27 x = \cos 3t.$ (05) a) Solve:  $(D^4 - 1)y = e^x \cos x$ . b) (05)
  - Show that the frequency of free vibration in a closed electrical circuit with **c**) (04) induction L and capacity C in series is  $\frac{30}{\pi\sqrt{1C}}$ .

#### Q-6 Attempt all questions

**a)** Solve: 
$$x^2 \frac{d^2 y}{dx^2} + x \frac{dy}{dx} + y = \log x \sin(\log x)$$
. (05)

- Using the method of variation of parameters solve (05)b)  $y'' - 6y' + 9y = \frac{e^{3x}}{x^2}.$
- Using convolution theorem find Laplace inverse transform of (04) c) 1

$$s^{2}(s-1)$$

Attempt all questions (14)  
a) Solve 
$$\frac{y^2 z}{x} \frac{\partial z}{\partial x} + xz \frac{\partial z}{\partial y} = y^2$$
. (05)

Solve by the method of separation of variables 4  $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 3u$ , given that (05)**b**)  $u = 3 e^{-y} - e^{-5y}$  when x = 0.

Find  $\sqrt{10}$  correct to three decimal places by using Newton – Raphson iteration (04) **c**) formula.

### Q-8

Q-7

Q-5

# Attempt all questions

- Using Bisection method, find the root of  $2 \sin x x = 0$ . (05) a)
- Using RegulaFalsi method find real root of  $x \log_{10} x 1.2 = 0$  correct to (05) b) four decimal places.

c) Solve: 
$$y^2 p - xyq = x (z - 2y)$$
. (04)

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