# C.U.SHAH UNIVERSITY **Summer Examination-2016**

## Subject Name : Engineering Mathematics - IV

	Subject	Code :4TE04EMT1	Branch:	B.Tech (Auto,N	lech,EEE,EE,	IC,Civil,EC)	
	Semester	r:4 Date:0	07/05/2016	<b>Time : 2:</b>	30 To 5:30	Marks : 70	
	Instructio (1) U (2) I (3) I (4) A	ons: Use of Programmable Instructions written on Draw neat diagrams ar Assume suitable data i	calculator & any main answer bo nd figures (if neo f needed.	y other electron bok are strictly t cessary) at right	ic instrument is to be obeyed. places.	prohibited.	
Q-1		Attempt the followi	ing questions:				(14)
Atte	a) b) c) d) e) f) g) h) i) j) k) mpt any f	Write Fourier sine tr A vector $\vec{F}$ is soleno In usual notation $E=$ The function $\bar{z}$ is not The function $e^x \cos z$ The region $ z  \le 1$ is Range – Kutta methor The convergence in $\vec{r}$ method. True or Fals If $\phi = 3x^2y - y^3z^2$ State Green's theore If $y = 3x^3 - 2x^2 + z^3$	ansform of $f(t)$ idal if i 1 – $\nabla$ . True or t analytic at any s y is not harmor represent open u od is better than the Gauss – Seic se? f, find gradient m. 1 find $\Delta^3 y$ . Q-2 to Q-8	False point. True or H nic. True or Fals init disk. True o Tayler's metho dal method is fa $\phi$ at the point of	False? e? r False? d. True or False ster than Gauss (1,-2,1)	e? – Jacobi	(01) (01) (01) (01) (01) (01) (01) (02) (02) (02)
Q-2	a)	Attempt all question Find the Fourier cost evaluate $\int_{-\infty}^{\infty} \frac{\cos \lambda x}{\cos \lambda x}$	<b>ns</b> integral of $f$	$(x)=e^{-kx} (x)$	> 0, <i>k</i> > 0). U	Jsing that	(14) (05)
	b)	Solve the one dimen 0 with the initial con	sional wave equinditions $u(x, 0)$	$ \begin{array}{l} \operatorname{hation} \frac{\partial^2 u}{\partial x^2} = \frac{1}{c} \\ 0 = f(x), \frac{\partial u(x)}{\partial t} \end{array} \end{array} $	$\frac{\partial^2 u}{\partial t^2}, -\infty < g(x)$ and	$x < \infty, t >$	(05)
	c)	boundary conditions Find the Fourier tran	$u, \frac{\partial u}{\partial x} \to 0 \text{ as } x$ as form of $f(x)$ it		0 < x < a $a \le x \le b$ x > b		(04)
			Pag	e 1    3			



(14)

(04)

(14)

(05)

(14)

(14)

#### Q-3 Attempt all questions

a)	Determine analytic function	whose imaginary part is $e^x$	$(x\cos y - y\sin y)$	(05)
----	-----------------------------	-------------------------------	-----------------------	------

- b) If f(z) = u + iv is an analytic function of z and  $u + v = e^{x} (\cos y + \sin y)$ , find f(z). (05)
- c) Find p such that the function  $f(z) = r^2 \cos 2\theta + i r^2 \sin p\theta$  is analytic. (04)

#### Q-4 Attempt all questions

- (14) (05)
- **a**) Under the transformation  $w = \frac{1}{z}$ 
  - i. Find the image of |z 2i| = 2.
  - ii. Show that the image of the hyperbola  $x^2 y^2 = 1$  is the lemniscate  $\rho^2 = \cos 2\theta$
- b) Find the bilinear transformation which sends the points  $z = 0, 1, \infty$  in to the points w = -5, -1, 3 respectively. What are the invariant points of the transformation? (05)
- c) Following table gives the values of *x* and *y*:

x	1.0	1.05	1.10	1.15	1.20	1.25	1.30
у	1.00	1.02470	1.04881	1.07238	1.09544	1.11803	1.14017
dv							

Find  $\frac{dy}{dx}$  for x = 1.05 using forward difference.

#### Q-5 Attempt all questions

- a) Solve by Gauss Jordan method (05) 5x - 2y + 3z = 18, x + 7y - 3z = -22, 2x - y + 6z = 22.
- b) Solve the equation 27 x + 6y - z = 85, 6x + 5y + 2z = 72, x + y + 54z = 110 by Gauss – Seidel method.

c) If 
$$\vec{F} = (x + y + 1)i + j - (x + y)k$$
 find  $\vec{F} \cdot curl \vec{F}$ . (04)

#### Q-6

## Attempt all questions

- a) Verify Green's theorem for the function  $\vec{F} = (x + y) i + 2xy j$  and C is the rectangle in XY -plane bounded by x = 0, y = 0, x = a, y = b. (07)
- b) Verify Stokes's theorem for  $\vec{A} = (2x y)i yz^2 j y^2 z k$ , where S is the upper half surface of sphere  $x^2 + y^2 + z^2 = 1$  and C is its boundary. (07)

### Q-7 Attempt all questions

- a) Use the fourth order RungeKutta method to solve  $\frac{dy}{dx} = y \frac{2x}{y}$ , y(0) = 1. (05) Evaluate the value of y when x = 0.1
- **b**) Find the value of y for x = 0.1 by Picard's method, given that (05)

#### Page 2 || 3



$$\frac{dy}{dx} = \frac{y - x}{y + x}, y(0) = 1$$

x	30	35	40	45	50		
у	15.9	14.9	14.1	13.3	12.5		
Find value	of $x$ correspo	onding to y	= 13.6		÷		
Attempt all	questions						
Construct Ne	wton's forwa	ard interpola	ation polynom	ial for the fol	llowing data:		
Х	4	6	8		10		
Y	1	3	8		16		
Use it to find	the value of	y for $x = 1$	5.		÷		
Use Lagrange's interpolation formula to find the value of y when $x = 10$ , if the							
values of x and y are given below:							
Х	5	6	9		11		

by Simpson's  $\frac{1}{3}$  rule.

Q-8

Page 3 || 3

