Enrollment No:

Exam Seat No:

C. U. SHAH UNIVERSITY

Winter Examination-2019

Subject Name: Engineering Mathematics - IV

Subject Code: 4TE04EMT1 Branch: B. Tech (Civil, Electrical, EC, Mech)

Semester: 4 Date: 01/10/2019 Time: 02:30 To 05:30 Marks: 70

Instructions:

- (1) Use of Programmable calculator & any other electronic instrument is prohibited.
- (2) Instructions written on main answer book are strictly to be obeyed.
- (3) Draw neat diagrams and figures (if necessary) at right places.
- (4) Assume suitable data if needed.

Q-1 Attempt the following questions:

(14)

a) The Fourier cosine transform of $f(x) = 5e^{-2x}$ is

(A)
$$\sqrt{\frac{2}{\pi}} \left(\frac{10}{\lambda^2 + 4} \right)$$
 (B) $\sqrt{\frac{2}{\pi}} \left(\frac{2}{\lambda^2 + 4} \right)$ (C) $\sqrt{\frac{2}{\pi}} \left(\frac{10}{\lambda^2 - 4} \right)$ (D) none of

these

The Fourier sine transform of $f(x) = \begin{cases} 1, & 0 < x < a \\ 0, & x > a \end{cases}$ is

(A)
$$\sqrt{\frac{2}{\pi}} \left(\frac{1 + \cos a\lambda}{\lambda} \right)$$
 (B) $\sqrt{\frac{2}{\pi}} \left(\frac{1 - \cos a\lambda}{\lambda^2} \right)$ (C) $\sqrt{\frac{2}{\pi}} \left(\frac{1 - \cos a\lambda}{\lambda} \right)$

- (D) none of these
- c) The image of circle |z-1|=1 in the complex plane, under the mapping

$$w = \frac{1}{z}$$
 is

(A)
$$|w-1| = 1$$
 (B) $u^2 + v^2 = 1$ (C) $v = \frac{1}{z}$ (D) $u = \frac{1}{z}$

d) If w = f(z) = u(x, y) + iv(x, y) is analytic then f'(z) equal to

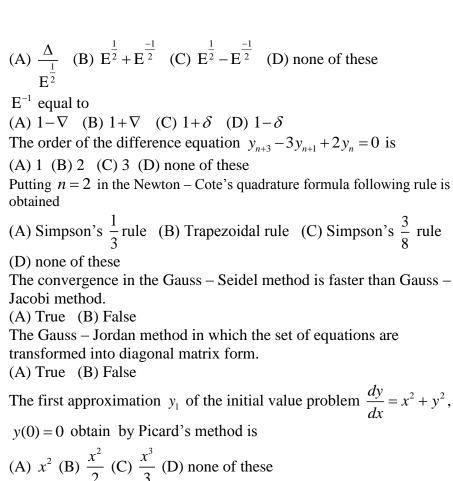
(A)
$$\frac{\partial u}{\partial x} - i \frac{\partial u}{\partial y}$$
 (B) $\frac{\partial u}{\partial x} - i \frac{\partial v}{\partial x}$ (C) $\frac{\partial v}{\partial y} - i \frac{\partial v}{\partial x}$ (D) none of these

- e) The magnitude of acceleration vector at t = 0 on the curve $x = 2\cos 3t$, $y = 2\sin 3t$, z = 3t is
 - (A) 6 (B) 9 (C) 18 (D) 3

f) If
$$\vec{A}(t) = 3t^2i + 4tj + 4t^3k$$
, $\int_{t=1}^{t=2} \vec{A}(t) dt$ equal to

- (A) 15i+6j+7k (B) 7i+6j+5k (C) 7i+15j+6k
- (D) none of these
- **g**) δ equal to





h)

k)

m)

Q-3

Which of the following methods is the best for solving initial value problems:

(A) Taylor's series method (B) Euler's method

(C) Runge-Kutta method of 4thorder (D) Modified Euler's method

Attempt any four questions from Q-2 to Q-8

Q-2 Attempt all questions **(14)**

a) Consider following tabular values

х	50	100	150	200	250
у	618	724	805	906	1032

Using Newton's Backward difference interpolation formula determine y(300).

b) Use Stirling's formula to find y_{28} given that **(5)** $y_{20} = 49225$, $y_{25} = 48316$, $y_{30} = 47236$, $y_{35} = 45926$ and $y_{40} = 44306$.

c) Find the finite Fourier sine transform of $f(x) = lx - x^2$, $0 \le x \le l$. **(4)**

Attempt all questions (14)

a) Solve the following system of equations by Gauss-Seidal method. **(5)** 30x-2y+3z=75, 2x+2y+18z=30, x+17y-2z=48

(5) From the following table of values of x and y, find $\frac{dy}{dx}$ for x = 1.05. 1.00 1.05 1.15 1.25 \boldsymbol{x} 1.10 1.20



(5)

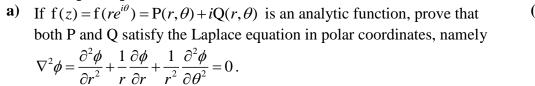
(4) (14) (5) (5) (4) (14) (5)
(14) (5) (5) (4) (14) (5)
(5) (5) (4) (14) (5)
(5) (5) (4) (14) (5)
(5) (4) (14) (5)
(4) (14) (5)
(14) (5)
(5)
(5)
(5)
(5)
(5)
(5)
(5)
(4)
(14)
(5)
(5)
(4)
(-)
(14)
(5)

Q-4

Q-5

Q-6

Q-7



b) If $\vec{F} = (2xy + z^3)\hat{i} + x^2\hat{j} + 3xz^3\hat{k}$, show that $\int_C \vec{F} \cdot d\vec{r}$ is independent of the **(5)** path of integration. Hence evaluate the integral when C is any path



joining A(1, -2, 1) to B(3, 1, 4).

- c) Use Trapezoidal rule to evaluate $\int_{0}^{1} x^{3} dx$ considering five sub-intervals. (4)
- Q-8 Attempt all questions (14)
 - a) Use Runge-kutta second order method to find the approximate value of y(0.2) given that $\frac{dy}{dx} = x y^2$ and y(0) = 1 and h = 0.1.
 - **b)** Using Fourier integral show that $\int_{0}^{\infty} \frac{1 \cos \pi \lambda}{\lambda} \sin x\lambda \ d\lambda = \begin{cases} \frac{\pi}{2} & \text{if } 0 < x < \pi \\ 0 & \text{if } x > \pi \end{cases}$ (5)
 - c) Find the angle between the tangents to the curve $x = t^2 + 1$, y = 4t 3, $z = 2t^2 6t$ at the points t = 1 and t = 2.

