Enrollment No: _____ Exam Seat No:_____

C.U.SHAH UNIVERSITY

Summer Examination-2018

Subject Name : Mathematics-I

Subject Code : 4SC01MTC1 **Branch : B.Sc. (All)**

Semester : 1 **Date : 23/03/2018** **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) What is difference between matrix and determinant? (1)
b) Write taylor's series of log(1+x) at x=0 . (1)
c) True/false : Machlaurin's series is particular case of Taylor's series . (1)
d) Can you apply Roll's theorem for the function f(x) = $|x+2|$ in $[-3, 4]$? Give the reason of your answer? (1)
e) True/false : If detA= 9 then the matrix is invertible. (1)
f) If A is 2 x 3 matrix and B is 3 x 8 matrix then What is order of B.A ? (1)
g) True/false :Every skew- symmetric metrix must have all diagonal entry zero. (1)
h) What is transpose of matrix? (1)
i) What is difference between identity matrix and null matrix? (1)
j) Define: Differential equation? (1)
k) Give an example of exact differential equation. (1)
l) True/false : Every invertible matrix must have one none zero raws . (1)
m) Write an example of partial differential equation with order 3 and degree 2. (1)
n) Solve : xydy + (x^2+x)dx = 0. (1)

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

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

a) Define : Orthogonal matrix . **(2)**

b) Find inverse of $\begin{bmatrix} 6 & -1 \\ 2 & 1 \end{bmatrix}$. **(4)**

c) If A=$\begin{bmatrix} -1 & -2 & 2 \\ -2 & 2 & 3 \\ -1 & 1 & 3 \end{bmatrix}$ and B=$\begin{bmatrix} -2 & -3 & 4 \\ -2 & -5 & 5 \\ -3 & 8 & 1 \end{bmatrix}$, then find (i) A^2 (ii) B^2 **(8)**

Is $A^2 - 9B^2$ =(A +3 B)(A – 3B) ?

Q-3 **Attempt all questions** **(14)**

a) What is raw echnol form of the matrix ? **(2)**

b) Discuss the consistency problem for the system **(4)**

$x + y + z = -1$

$2x+y+2z = -2$

$x + y + 3z = -3.$

c) Find the rank by (1) Reduced raw echnol form (2) Normal form . **(8)**
for the matrix

$$A=\begin{bmatrix} 1 & -2 & 3 & 5 & 4 \\ 3 & 4 & 5 & 6 & 4 \\ -1 & 4 & -8 & 2 & 5 \end{bmatrix}$$

Q-4 **Attempt all questions** **(14)**

a) Define: Characteristic roots of the matrix . **(2)**

b) Find the Eigen value of **(4)**

$$\begin{bmatrix} 1 & 2 & 3 \\ 0 & 7 & 7 \\ 0 & 0 & -4 \end{bmatrix}.$$

c) Write the charectristic equation for the following matrix and verify Caley – Hamilton theorem for it . **(8)**

$$A=\begin{bmatrix} -1 & 2 & 3 \\ 2 & 7 & -8 \\ 5 & 1 & -1 \end{bmatrix}.$$

Q-5 **Attempt all questions** **(14)**

a) Define :Degree of differential equation. **(2)**

b) Solve: (9x+3y-6) dx + (3x+11y+4)dy=0. **(4)**

c) What is linear differential equation in x ? Solve: $\frac{dy}{dx} + \frac{y}{x} = \sin x$; where $y(\pi) = 1$. **(8)**

Q-6 **Attempt all questions** **(14)**

a) State and prove Roll's theorem. **(7)**

b) State Cauchy's mean value theorem and verify it for the functions $f(x)= x^2$, **(7)**
$g(x) = x\, x^4$, where $x \in [1, 2]$.

Q-7 **Attempt all questions** **(14)**

a) Find order and degree of the following ODE. **(2)**

$\left(\frac{dy}{dx}\right)^7 + \frac{xy}{\left(\frac{dy}{dx}\right)^3} + 1 = 0$.

b) Evaluate **(4)**

$$\lim_{x \to 0+} (\arcsin x)^{2x} .$$

c) Solve : **(8)**

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

(2) $y = 2px + y^2p^3$.

Q-8 **Attempt all questions** **(14)**

a) What is Cartesian coordinates for the points $(-2, -45^o)$? **(2)**

b) Evaluate the following : **(6)**

(1) $\lim_{x \to \infty} (e^{x+e^{-x}} - e^x)$.

(2) $\lim_{x \to \frac{\pi}{2}} (sinx)^{tanx}$.

c) Locate the following points in respective coordinates. **(6)**

(1) $x = 3\cos 60^0$, $y = 3\sin 60^0$.

(2) $(6, 135^0)$.

(3) $(-\pi , e)$.