

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 : Maclaurin'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 $\det A = 9$ then the matrix is invertible. (1)
 - f) If A is 2×3 matrix and B is 3×8 matrix then What is order of $B.A$? (1)
 - g) True/false : Every skew-symmetric matrix 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 non zero row. (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 $A^2 - 9B^2 = (A + 3B)(A - 3B)$?



- Q-3** **Attempt all questions** (14)
- a) What is row echlon form of the matrix ? (2)
- b) Discuss the consistency problem for the system (4)
- $$\begin{aligned} x + y + z &= -1 \\ 2x + y + 2z &= -2 \\ x + y + 3z &= -3. \end{aligned}$$
- c) Find the rank by (1) Reduced row echlon 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 – (8)
Hamilton theorem for it .

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

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

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 $(-2, -45^\circ)$? (2)

b) Evaluate the following : (6)

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

(2) $\lim_{x \rightarrow \frac{\pi}{2}} (\sin x)^{\tan x} .$

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

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

(2) $(6, 135^\circ)$.

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

