

C. U. SHAH UNIVERSITY

Winter Examination-2022

Subject Name: Mathematics - I

Subject Code: 4SC01MAT1

Branch: B.Sc. (All)

Semester: 1

Date: 04/01/2023

Time: 11:00 To 02:00

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) If $A = \begin{bmatrix} 2 & 2 \\ 13 & 20 \end{bmatrix}$ then $|A| =$ _____
 (a) 11 (b) 12 (c) 13 (d) 14
- b) If $A = \begin{bmatrix} 1 & 2 & 4 \\ 2 & 1 & 3 \\ 5 & 6 & 0 \end{bmatrix}$ then cofactor of '4' is _____.
 (a) 5 (b) 6 (c) 7 (d) 8
- c) The Cartesian Co – ordinates of polar coordinates $(1, \frac{\pi}{2})$ is _____.
 (a) (0,1) (b) (1,0) (c) $(1, \sqrt{3})$ (d) None
- d) If $y = x^7$ then $y_7 =$ _____.
 (a) 5! (b) 6! (c) 7! (d) 8!
- e) Which of the following is indeterminate forms?
 (a) 0^0 (b) $0 \cdot \infty$ (c) ∞^∞ (d) All
- f) $\lim_{x \rightarrow 0} \frac{\tan x}{x}$ is of the form _____.
 (a) $\frac{\infty}{\infty}$ (b) $\infty - \infty$ (c) $\frac{0}{0}$ (d) 0^0
- g) Which of the following is Clairaut's equation?
 (a) $y = 2p^2x + x^3$ (b) $y = px + \frac{a}{p}$
 (c) $yp^2 = px + x^3p^3$ (d) All
- h) Polar co-ordinates of (3,4) are _____.
 (a) $(5, \frac{\pi}{2})$ (b) $(3, \frac{\pi}{4})$ (c) $(5, \tan^{-1} \frac{5}{3})$ (d) $(5, \tan^{-1} \frac{4}{3})$
- i) The necessary and sufficient condition for the differential equation to be exact is
 (a) $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$ (b) $\frac{\partial M}{\partial x} = \frac{\partial N}{\partial y}$ (c) $\frac{\partial M}{\partial y} = -\frac{\partial N}{\partial x}$ (d) None



- j) Integrating factor for the linear differential equation $\frac{dx}{dy} + Px = Q$,
 where P and Q are a function of y or may constant is
 (a) $e^{\int P dy}$ (b) $e^{\int P dx}$ (c) $e^{-\int P dy}$ (d) $e^{-\int P dx}$
- k) Write expansion of e^x in terms of x.
- l) Find order and degree of given equation:

$$\left[1 + \left(\frac{d^3y}{dx^3}\right)^2\right]^3 = \left(\frac{d^2y}{dx^2}\right)^4$$
- m) Define: Symmetric Matrix
- n) Solve: $(D^2 - 3D - 4)y = 0$

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

Q-2 Attempt all questions (14)

A If $A = \begin{bmatrix} 1 & 0 & 4 \\ 0 & 2 & 1 \\ 5 & 4 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 1 & 0 \\ 7 & 0 & 5 \\ 2 & 5 & 1 \end{bmatrix}$ and $C = \begin{bmatrix} 3 & 0 & 5 \\ 6 & 9 & -1 \\ 7 & 8 & -2 \end{bmatrix}$ then find a matrix X such that $4A + 3B - 5C = X$ **05**

B If $A = \begin{bmatrix} 1 & 2 \\ 2 & 1 \\ 1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$ then find $5AB$ and $4BA$. **05**

C Express the following terms with example **04**
 (i). Symmetric Matrix (ii). Upper Triangular Matrix

Q-3 Attempt all questions (14)

A Find the Inverse of the matrix $A = \begin{bmatrix} 2 & 3 & 1 \\ 1 & 2 & 3 \\ 3 & 1 & 2 \end{bmatrix}$. **06**

B Find the characteristic equation of matrix $A = \begin{bmatrix} 1 & 1 & 2 \\ 3 & 1 & 1 \\ 2 & 3 & 1 \end{bmatrix}$ **04**

C Find n^{th} derivatives of $\cos x \cos 2x \cos 3x$. **04**

Q-4 Attempt all questions (14)

A Verify Cayley-Hamilton theorem for the matrix $A = \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$. **05**

B Solve given system of equation by using Gauss Elimination method. **05**
 $x + y + z = 6, x - y + z = 2, 2x + y - z = 1$.

C Expand $e^x \sin x$ in power of x by Maclurin's series. **04**

Q-5 Attempt all questions (14)

A Solve : $(x^2 - y^2)dx + 2xy dy = 0$. **05**

B Solve: $\frac{dy}{dx} = \cos x \cos y - \sin x \sin y$. **05**



- C Solve the differential equation: $\frac{dy}{dx} = e^{x-y} + x^2 e^{-y}$. **04**
- Q-6 Attempt all questions (14)**
- A State and prove Leibnitz's theorem. **07**
- B Obtain spherical and cylindrical co-ordinates of the point whose Cartesian co-ordinates are $(-\sqrt{3}, -1, 2\sqrt{3})$. **07**
- Q-7 Attempt all questions (14)**
- A Evaluate: $\lim_{x \rightarrow 0} \frac{x - \sin x \cos x}{x^3}$. **05**
- B Solve: $x^2(y - px) = yp^2$. **05**
- C Solve: $p(p + y) = x(x + y)$. **04**
- Q-8 Attempt all questions (14)**
- A Expand $f(x) = x^4 - 11x^3 + 43x^2 - 60x + 14$ in power of $(x - 3)$. **05**
- B Solve $\frac{dy}{dx} + y \cot x = 4x \operatorname{cosec} x$ where $y\left(\frac{\pi}{2}\right) = 0$. **06**
- C Write down relation between Polar and Cartesian co-ordinate and relation between Cartesian and spherical co-ordinate. **03**

