Enrollment No: _____   Exam Seat No: _____

C.U. SHAH UNIVERSITY
Winter Examination-2020

Subject Name: Basic Mathematics

Subject Code: 2TE01BMT1   **Branch: Diploma (All)**

Semester: 1   **Date: 09/03/2021**   **Time: 03:00 To 06:00**   **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) $\log 1 = $ _____.
       a) 0   b) e c) 1   d) none of these   1

b) $\log_e e = $ _____.
       a) 3   b) 2   c) 1   d) none of these   1

c) $\binom{n}{0} = $ _____.
       a) n b) 0   c) 1   d) $n-1$ 1

d)   _____ is a constant term in the expansion of $\left(x + \dfrac{1}{x} \right)^4$.
       a) 7th b) 5th c) 4th d) 3rd 1

e)   Co-efficient of x^3 in the expansion of $(1 + x)^3$ is _____.
       a) 1   b) 0   c) 4   d) 6   1

f)   If $A = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ is a square matrix then $A' = $ _____.
       a) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ b) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ c) $\begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}$ d) none of these   1

g)   If $A = \begin{bmatrix} -4 & 2 \\ 3 & -1 \end{bmatrix}$ then $adjA = $ _____.
       a) $\begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix}$ b) $\begin{bmatrix} -1 & -2 \\ -3 & -4 \end{bmatrix}$ c) $\begin{bmatrix} -4 & 2 \\ 3 & -1 \end{bmatrix}$ d) $\begin{bmatrix} -4 & -2 \\ -3 & -1 \end{bmatrix}$ 1

h) If $\begin{vmatrix} 2 & 1 \\ 1 & 2 \end{vmatrix} =$ _____.

a) 2   b) 0   c) 3 d) 1   1

i) $\sin^2 30° + \cos^2 30° =$ _____.

a) -1 b) 0   c) 1   d) none of these   1

j) If $\theta = \frac{\pi}{2}$ then the value of $\sin\theta + \cos\theta =$ _____.

a) 2   b) 0   c) 1   d) -1   1

k) $\sin\alpha\cos\beta + \cos\alpha\sin\beta =$ _____.

a) $\sin(\alpha+\beta)$ b) $\sin(\alpha-\beta)$ c) $\cos(\alpha+\beta)$ d) $\cos(\alpha-\beta)$ 1

l) If $\bar{a} = i + 2j + 4k$ then $|\bar{a}| =$ _____.

a) 7   b) 5   c)$\sqrt{21}$ d) none of these   1

m) If vectors $\bar{a}$ and $\bar{b}$ are perpendicular to each other then $\bar{a}\cdot\bar{b} =$ _____.

a) 1   b) 0   c) -1   d) none of these   1

n) If$\bar{a} = (1,0,2)$ and $\bar{b} = (0,1,3)$ then $\bar{a}\cdot\bar{b} =$ _____.

a) 1   b) 7   c) 6   d) None of these   1

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

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

a) Prove that $\log_{10}800 = 2 + 3\log_{10}2$.   (05)

b) Solve: $\dfrac{4\log 3 \times \log x}{\log 9} = \log 27$ (05)

c) Prove that $\log_{y^3} x^2 \log_{z^4} y^3 \log_{x^2} z^4 = 1$.   (04)

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

a) If $A = \begin{bmatrix} 1 & -1 \\ 3 & 0 \end{bmatrix}$ and$B \begin{bmatrix} -1 & 2 \\ 0 & -1 \end{bmatrix}$are two matrices then verify that $(AB)^T = B^T A^T$ (05)

b) Find the inverse of the matrix $A = \begin{bmatrix} 1 & 0 & 1 \\ -1 & 2 & 3 \\ 0 & -3 & 2 \end{bmatrix}$.   (05)

c) If $A = \begin{bmatrix} 1 & -1 \\ 3 & -5 \end{bmatrix}$ and$B = \begin{bmatrix} 2 & 3 \\ -2 & -7 \end{bmatrix}$then find matrix $A+B$ and $A-B$.   (04)

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

a) If $A = \begin{bmatrix} 1 & -2 & 3 \\ 2 & 6 & 1 \\ -3 & 0 & 6 \end{bmatrix}$ then find the value of A^2.   (05)

b) Solve the equations $2x - 3y = 3$ and $5x - 4y = 11$ by using matrix method. (05)

c) Find the midterm of $(2x + y)^4$. (04)

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

a) Find the co-efficient of x^3 in the expansion of $(x + 3)^6$.. (05)

b) Expand: $(x + 3)^5$ (05)

c) If the midterm of $\left(\dfrac{x}{3} + 3\right)^{10}$ is 8064 then find the value of x. (04)

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

a) Find the constant term of $\left(\dfrac{x}{2} + \dfrac{1}{x}\right)^8$. (05)

b) Simplify: $(i + j + k) \cdot \left[(i - 2j + 2k) \times (i - 2j + k)\right]$ (05)

c) Prove that angle between two vectors $i + 2j$ and $i + j + 3k$ is $\sin^{-1}\sqrt{\dfrac{46}{55}}$. (04)

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

a) Prove that $\sin^2 60° - 3\tan^2 30° + \cot^2 30° - 3\cos ec^2 60°$. (05)

b) Forces $F_1 = i + j - k$ and $F_2 = i + 2j - k$ act on a particle under the influence of these forces, particle moves from point $(-3, 1, 2)$ to $(1, 2, 0)$. Find the work done. (05)

c) If $\bar{a} = (1, 2, 3)$, $\bar{b} = (-1, 0, 3)$ and $\bar{c} = (0, 1, -2)$ then find $\bar{a} + \bar{b} - \bar{c}$ and $\left|\bar{a} + \bar{b} - \bar{c}\right|$. (04)

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

a) Prove that $\dfrac{\sin 7A + \sin 3A}{\cos 3A - \cos 7A} = \cot 2A$. (05)

b) Draw the graph of $y = \cos x, \quad 0 \le x \le \pi$. (05)

c) Prove that $\sin^2 \dfrac{\pi}{4} + \sin^2 \dfrac{3\pi}{4} + \sin^2 \dfrac{5\pi}{4} + \sin^2 \dfrac{7\pi}{4} = 2$ (04)