

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)  $nb$  b) 0 c) 1 d)  $n-1$  1
- d) \_\_\_\_\_ is a constant term in the expansion of  $\left(x + \frac{1}{x}\right)^4$ .  
a) 7<sup>th</sup> b) 5<sup>th</sup> c) 4<sup>th</sup> d) 3<sup>rd</sup> 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  $\begin{vmatrix} 2 & 1 \\ 1 & 2 \end{vmatrix} = \underline{\hspace{2cm}}$ .  
 a) 2      b) 0      c) 3      d) 1 1
- i)  $\sin^2 30^\circ + \cos^2 30^\circ = \underline{\hspace{2cm}}$ .  
 a) -1   b) 0      c) 1      d) none of these 1
- j) If  $\theta = \frac{\pi}{2}$  then the value of  $\sin \theta + \cos \theta = \underline{\hspace{2cm}}$ .  
 a) 2      b) 0      c) 1      d) -1 1
- k)  $\sin \alpha \cos \beta + \cos \alpha \sin \beta = \underline{\hspace{2cm}}$ .  
 a)  $\sin(\alpha + \beta)$       b)  $\sin(\alpha - \beta)$       c)  $\cos(\alpha + \beta)$       d)  $\cos(\alpha - \beta)$  1
- l) If  $\vec{a} = i + 2j + 4k$  then  $|\vec{a}| = \underline{\hspace{2cm}}$ .  
 a) 7      b) 5      c)  $\sqrt{21}$       d) none of these 1
- m) If vectors  $\vec{a}$  and  $\vec{b}$  are perpendicular to each other then  $\vec{a} \cdot \vec{b} = \underline{\hspace{2cm}}$ .  
 a) 1      b) 0      c) -1      d) none of these 1
- n) If  $\vec{a} = (1, 0, 2)$  and  $\vec{b} = (0, 1, 3)$  then  $\vec{a} \cdot \vec{b} = \underline{\hspace{2cm}}$ .  
 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:  $\frac{4 \log 3 \times \log x}{\log 9} = \log 27$  (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  $\left(\frac{x}{3} + 3\right)^{10}$  is 8064 then find the value of  $x$ . (04)

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

- a) Find the constant term of  $\left(\frac{x}{2} + \frac{1}{x}\right)^8$ . (05)
- b) Simplify:  $(i + j + k) \cdot [(i - 2j + 2k) \times (i - 2j + k)]$  (05)
- c) Prove that angle between two vectors  $i + 2j$  and  $i + j + 3k$  is  $\sin^{-1} \sqrt{\frac{46}{55}}$ . (04)

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

- a) Prove that  $\sin^2 60^\circ - 3 \tan^2 30^\circ + \cot^2 30^\circ - 3 \operatorname{cosec}^2 60^\circ$ . (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  $\vec{a} = (1, 2, 3)$ ,  $\vec{b} = (-1, 0, 3)$  and  $\vec{c} = (0, 1, -2)$  then find  $\vec{a} + \vec{b} - \vec{c}$  and  $|\vec{a} + \vec{b} - \vec{c}|$ . (04)

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

- a) Prove that  $\frac{\sin 7A + \sin 3A}{\cos 3A - \cos 7A} = \cot 2A$ . (05)
- b) Draw the graph of  $y = \cos x$ ,  $0 \leq x \leq \pi$ . (05)
- c) Prove that  $\sin^2 \frac{\pi}{4} + \sin^2 \frac{3\pi}{4} + \sin^2 \frac{5\pi}{4} + \sin^2 \frac{7\pi}{4} = 2$  (04)

