

# C. U. SHAH UNIVERSITY

## Summer Examination-2020

Subject Name : Basic Mathematics

Subject Code : 2TE01BMT1

Branch: Diploma (All)

Semester : 1

Date : 26/02/2020

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)  $\log_{10} 0.0001 = \underline{\hspace{2cm}}$   
(A) -4 (B) 1 (C) 0 (D) 4
- b)  $4^{-\log_4 5} = \underline{\hspace{2cm}}$   
(A) 5 (B)  $\frac{1}{5}$  (C)  $\frac{5}{2}$  (D)  $\frac{2}{5}$
- c)  $\frac{\log \sqrt[3]{36}}{\log \sqrt{6}} = \underline{\hspace{2cm}}$   
(A) 6 (B)  $\log 6$  (C)  $\frac{4}{3}$  (D)  $\frac{3}{4}$
- d) If  $\begin{vmatrix} x & -2 \\ 3 & -5 \end{vmatrix} = -4$  then  $x = \underline{\hspace{2cm}}$ .  
(A)  $-\frac{2}{5}$  (B)  $\frac{2}{5}$  (C) -2 (D) 2
- e) If  $A = \begin{bmatrix} 1 & 2 \\ 3 & 1 \\ 4 & 2 \end{bmatrix}$  then  $A^T = \underline{\hspace{2cm}}$ .  
(A)  $\begin{bmatrix} 2 & 1 \\ 1 & 3 \\ 2 & 4 \end{bmatrix}$  (B)  $\begin{bmatrix} 1 & 3 & 4 \\ 2 & 1 & 2 \end{bmatrix}$  (C)  $\begin{bmatrix} 1 & 2 \\ 3 & 1 \\ 4 & 2 \end{bmatrix}$  (D) None of these
- f) Order of matrix  $\begin{bmatrix} 1 & 2 & 5 \\ 2 & 3 & 7 \end{bmatrix}$  is  $\underline{\hspace{2cm}}$ .  
(A)  $2 \times 3$  (B)  $3 \times 2$  (C)  $2 \times 2$  (D) None of these
- g)  $-3(5, -1, -2) + 8(1, 1, 0) = \underline{\hspace{2cm}}$   
(A) (7, 11, 6) (B) (7, -11, 6) (C) (7, 11, -6) (D) (-7, 11, 6)
- h) If  $\vec{a} = i + j - k$  then  $\hat{a} = \underline{\hspace{2cm}}$



(A)  $\frac{(1,-1,1)}{\sqrt{3}}$  (B)  $\frac{(-1,1,1)}{\sqrt{3}}$  (C)  $\frac{(1,1,-1)}{\sqrt{3}}$  (D)  $\sqrt{3}$

- i)  $(2, -1, 3) \times (-4, 2, -6) = \underline{\hspace{2cm}}$ .  
 (A)  $(-8, -2, -18)$  (B)  $(8, 2, 18)$  (C)  $(0, 0, 0)$  (D) None of these
- j) Number of terms in the expansion of  $(4x + y)^5 = \underline{\hspace{2cm}}$ .  
 (A) 4 (B) 5 (C) 6 (D) 7
- k)  ${}^{25}C_{22} = \underline{\hspace{2cm}}$   
 (A) 2300 (B) 230 (C) 575 (D) 275
- l)  $\frac{\pi}{4}$  Radian =  $\underline{\hspace{2cm}}$  Degree  
 (A)  $60^\circ$  (B)  $30^\circ$  (C)  $45^\circ$  (D)  $90^\circ$
- m)  $20^\circ = \underline{\hspace{2cm}}$  Radian.  
 (A)  $\frac{\pi}{2}$  (B)  $\frac{3\pi}{2}$  (C)  $\frac{\pi}{9}$  (D)  $\frac{\pi}{3}$
- n)  $\tan\left(\frac{21\pi}{4}\right) = \underline{\hspace{2cm}}$   
 (A)  $\frac{-1}{\sqrt{3}}$  (B)  $\frac{1}{\sqrt{3}}$  (C) 1 (D)  $\sqrt{3}$

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

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

a) Prove that  $\frac{1}{\log_6 24} + \frac{1}{\log_{12} 24} + \frac{1}{\log_8 24} = 2$ . (5)

b) If  $\log\left(\frac{a-b}{2}\right) = \frac{1}{2}(\log a + \log b)$  then prove that  $a^2 + b^2 = 6ab$ . (5)

c) If  $A = \begin{bmatrix} 1 & 2 & 0 \\ -3 & 0 & 4 \end{bmatrix}$ ,  $B = \begin{bmatrix} 0 & -1 & -3 \\ 3 & 2 & 4 \end{bmatrix}$  then solve the equation (4)  
 $2(X + A) + 3B = 0$ .

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

a) If  $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$  then prove that  $A^2 - 4A - 5I = O$ . (5)

b) Using matrix method solve:  $2x + 3y = 7$  and  $4x = 9 + y$  (5)

c) Solve:  $\log_2(x+5) + \log_2(x-2) = 3$  (4)

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

a) A particle moves from the point  $-i - j - k$  to the point  $k + j + i$  under the effect of two constant forces  $2i + j + k$  and  $i + 3j + k$ . Find the work done. (5)

b) Find unit vector which is perpendicular to  $\vec{a} = 5i + 7j - 2k$  and  $\vec{b} = j - 2k + 3i$ . (5)



c) If  $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$ ,  $B = \begin{bmatrix} 1 & 2 \\ 2 & 1 \\ 1 & 2 \end{bmatrix}$  then find AB and BA (4)

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

a) If  $A = \begin{bmatrix} 2 & 1 & 5 \\ 0 & 3 & -1 \\ 2 & 5 & 0 \end{bmatrix}$  then find adjA. (5)

b) If  $A = \begin{bmatrix} 2 & -2 \\ 3 & 1 \end{bmatrix}$ ,  $B = \begin{bmatrix} -1 & 5 \\ 4 & -3 \end{bmatrix}$  then prove that  $(AB)' = B'A'$ . (5)

c) Evaluate:  $\sin\left(2 \tan^{-1} \frac{1}{3}\right)$  (4)

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

a) Find the 7<sup>th</sup> term of  $\left(\frac{4x}{5} - \frac{5}{2x}\right)^9$ . (5)

b) Find the middle term of  $\left(2x^2 + \frac{1}{3x}\right)^6$ . (5)

c) If  $\bar{a} = 3i - 2j + k$ ,  $\bar{b} = 2i - 4j - 3k$  and  $\bar{c} = -i + 2j + 2k$  then find modulus of  $2\bar{a} - 3\bar{b} - 5\bar{c}$ . (4)

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

a) Prove that  $\frac{\sin 4x + \sin 5x + \sin 6x}{\cos 4x + \cos 5x + \cos 6x} = \tan 5x$ . (5)

b) Prove that  $\tan 62^\circ = \frac{\cos 17^\circ + \sin 17^\circ}{\cos 17^\circ - \sin 17^\circ}$ . (5)

c) Find the approximate value of  $\sqrt[3]{1003}$  and  $\frac{1}{4.95}$ . (4)

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

a) Prove that  $\cos 4\theta = 8\cos^4\theta - 8\cos^2\theta + 1$ . (5)

b) Draw the graph of  $y = 2\cos x$  ( $0 \leq x \leq \pi$ ). (5)

c) Prove that  $\sin^{-1}\left(\frac{3}{5}\right) + \tan^{-1}\left(\frac{4}{3}\right) = \frac{\pi}{2}$ . (4)

