

# C.U.SHAH UNIVERSITY

## Summer Examination-2019

**Subject Name : Basic Mathematics****Subject Code : 2TE01BMT1****Branch: Diploma (All)****Semester : 1****Date : 14/03/2019****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)  $\log 1 \cdot \log 2 \cdot \log 3 \cdots \log n = \underline{\hspace{2cm}}$   
(A) 0 (B) 1 (C)  $\log(1+2+3+\dots+n)$  (D) None of these
- b)  $2^{-\log_2 5} = \underline{\hspace{2cm}}$   
(A) 5 (B)  $\frac{1}{5}$  (C)  $\frac{5}{2}$  (D)  $\frac{2}{5}$
- c)  $\frac{\log 36}{\log 6} = \underline{\hspace{2cm}}$   
(A) 6 (B)  $\log 6$  (C) 2 (D) None of these
- d) If  $x + \begin{bmatrix} -3 & 2 \\ 5 & 7 \end{bmatrix} = \begin{bmatrix} -2 & 4 \\ 8 & 11 \end{bmatrix}$  then  $x = \underline{\hspace{2cm}}$ .  
(A)  $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$  (B)  $\begin{bmatrix} -1 & -2 \\ -3 & -4 \end{bmatrix}$  (C)  $\begin{bmatrix} -1 & 2 \\ 3 & -4 \end{bmatrix}$  (D)  $\begin{bmatrix} 1 & -2 \\ -3 & 4 \end{bmatrix}$
- e) If  $A = \begin{bmatrix} 3 & 7 \\ 2 & 5 \end{bmatrix}$  then  $A + A^T = \underline{\hspace{2cm}}$ .  
(A)  $\begin{bmatrix} 6 & 10 \\ 9 & 9 \end{bmatrix}$  (B)  $\begin{bmatrix} 6 & 9 \\ 10 & 9 \end{bmatrix}$  (C)  $\begin{bmatrix} 10 & 9 \\ 9 & 6 \end{bmatrix}$  (D)  $\begin{bmatrix} 6 & 9 \\ 9 & 10 \end{bmatrix}$
- f) Order of  $\begin{bmatrix} 2 \\ 5 \end{bmatrix}$  is  $\underline{\hspace{2cm}}$ .  
(A)  $2 \times 2$  (B)  $2 \times 1$  (C)  $3 \times 2$  (D) None of these
- g) If  $\bar{x} = (1, 1, 1)$  and  $\bar{y} = (2, -2, 1)$  then  $\bar{x} \cdot \bar{y} = \underline{\hspace{2cm}}$   
(A) 5 (B) 1 (C) 0 (D) -1
- h) If  $\theta$  is the angle between the vectors  $\bar{x}$  and  $\bar{y}$  then  $\cos \theta = \underline{\hspace{2cm}}$   
(A)  $\frac{\bar{x} \cdot \bar{y}}{|\bar{x}| |\bar{y}|}$  (B)  $\frac{\bar{x} \times \bar{y}}{|\bar{x}| |\bar{y}|}$  (C)  $\frac{|\bar{x} \times \bar{y}|}{|\bar{x}| |\bar{y}|}$  (D)  $\frac{\bar{x} \times \bar{y}}{|\bar{x} \times \bar{y}|}$



- i) Magnitude of  $2i + j - 3k$  is \_\_\_\_\_.  
 (A) 6 (B) 2 (C) 0 (D)  $\sqrt{14}$
- j) Number of terms in the expansion of  $(5x + 7y)^6 =$  \_\_\_\_\_.  
 (A) 9 (B) 8 (C) 7 (D) 6
- k)  ${}^{12}C_5 =$  \_\_\_\_\_.  
 (A) 729 (B) 792 (C) 297 (D) 927
- l)  $\frac{3\pi}{2} =$  \_\_\_\_\_ Degree  
 (A)  $120^\circ$  (B)  $135^\circ$  (C)  $180^\circ$  (D)  $270^\circ$
- m)  $270^\circ =$  \_\_\_\_\_ Radian  
 (A)  $\frac{3\pi}{4}$  (B)  $\frac{3\pi}{2}$  (C)  $7\pi$  (D)  $4\pi$
- n)  $\sin(-225^\circ) =$  \_\_\_\_\_.  
 (A)  $\frac{1}{\sqrt{2}}$  (B)  $-\frac{1}{\sqrt{2}}$  (C)  $-\sqrt{2}$  (D)  $\sqrt{2}$

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

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

- a) Prove that  $\frac{1}{\log_x yz + 1} + \frac{1}{\log_y zx + 1} + \frac{1}{\log_z xy + 1} = 1$ . (5)
- b) Prove that  $\log_{10} 800 = 2 + 3\log_{10} 2$ . (5)
- c) If  $A = \begin{bmatrix} 1 & 2 & 1 \\ 3 & 4 & 2 \end{bmatrix}$ ,  $B = \begin{bmatrix} 3 & -2 & 4 \\ 1 & 5 & 0 \end{bmatrix}$  then find matrix X from  $X + A + B = 0$ . (4)

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

- a) If  $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$  then prove that  $A^2 - 5A + 7I = 0$ . (5)
- b) Using matrix method solve:  $5x + 3y = 11$  and  $3x - 2y = -1$  (5)
- c) Solve:  $\frac{\log x}{\log 8} = \frac{\log 256}{\log 64}$  (4)

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

- a) Constant forces  $3i - j + 2k$  and  $i + 3j - k$  act on a particle and the particle moves from the point  $2i + 3j + k$  to the point  $5i + 2j + 3k$ . Find the work done by the forces. (5)
- b) Prove that angle between two vectors  $i + 2j$  and  $i + j + 3k$  is (5)

$$\sin^{-1}\left(\sqrt{\frac{46}{55}}\right).$$

- c) If  $A = \begin{bmatrix} 1 & 4 \\ 3 & 2 \\ 2 & 5 \end{bmatrix}$  and  $B = \begin{bmatrix} -1 & -2 \\ 0 & 5 \\ 3 & 1 \end{bmatrix}$  then find value of  $2A - 3B$  and  $3A - 2B$ . (4)

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



a) If  $A = \begin{bmatrix} -4 & -3 & -3 \\ 1 & 0 & 1 \\ 4 & 4 & 3 \end{bmatrix}$  then prove that  $\text{adj}A = A$ . (5)

b) If  $A = \begin{bmatrix} 2 & 3 \\ 1 & 0 \end{bmatrix}$ ,  $B = \begin{bmatrix} 4 & 1 \\ 2 & -3 \end{bmatrix}$  then prove that  $(A+B)^T = A^T + B^T$ . (5)

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

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

a) Find the 5<sup>th</sup> term of  $\left(x^2 + \frac{1}{x}\right)^6$ . (5)

b) Find the constant term of  $\left(x - \frac{5}{x^3}\right)^8$ . (5)

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

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

a) Prove that  $\frac{\cos A + \cos 3A + \cos 5A}{\sin A + \sin 3A + \sin 5A} = \cot 3A$ . (5)

b) Prove that  $\tan 20^\circ + \tan 25^\circ + \tan 20^\circ \tan 25^\circ = 1$ . (5)

c) Prove that  $(\sqrt{3}+1)^4 + (\sqrt{3}-1)^4 = 56$  using binomial theorem. (4)

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

a) If  $\tan \theta = \frac{1}{2}$ , prove that  $7 \cos 2\theta + 8 \sin 2\theta = \frac{53}{5}$ . (5)

b) Draw the graph of  $y = \sin \frac{x}{2}$ ,  $(0 \leq x \leq 2\pi)$ . (5)

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

