

# C.U.SHAH UNIVERSITY

## Winter Examination-2018

**Subject Name : Basic Mathematics**

**Subject Code : 2TE01BMT1**

**Branch: Diploma (All)**

**Semester : 1**

**Date : 28/11/2018**

**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)  $\log 1 \cdot \log 2 \cdot \log 3 \cdots \log n =$   
 (A) 0 (B)  $\log(1+2+3+\cdots+n)$  (C)  $\log(1 \cdot 2 \cdot 3 \cdots n)$  (D) none of these
- b)  $5^{-\log_5 4} =$  \_\_\_\_\_  
 (A) 4 (B)  $4^{-1}$  (C) 5 (D)  $5^{-1}$
- c)  $\log_{10}(0.001) =$  \_\_\_\_\_  
 (A) 1 (B) 0 (C) -3 (D) None of these
- d) If  $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$  then  $\text{adj}A =$  \_\_\_\_\_.  
 (A)  $\begin{bmatrix} a & -b \\ -c & d \end{bmatrix}$  (B)  $\begin{bmatrix} -a & b \\ c & -d \end{bmatrix}$  (C)  $\begin{bmatrix} -a & -b \\ -c & -d \end{bmatrix}$  (D)  $\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$
- e) If  $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$  then  $A^T =$  \_\_\_\_\_.  
 (A)  $\begin{bmatrix} 1 & -2 \\ -3 & 4 \end{bmatrix}$  (B)  $\begin{bmatrix} -1 & 3 \\ 2 & -4 \end{bmatrix}$  (C)  $\begin{bmatrix} 4 & 3 \\ 2 & 1 \end{bmatrix}$  (D)  $\begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix}$
- f) Order of matrix  $\begin{bmatrix} 1 & 2 & 5 \\ 2 & 3 & 7 \end{bmatrix}$  is \_\_\_\_\_.  
 (A)  $2 \times 3$  (B)  $3 \times 2$  (C)  $2 \times 2$  (D) None of these
- g) If  $\bar{x} = (1, 1, 1)$  and  $\bar{y} = (1, 0, 0)$  then  $\bar{x} - \bar{y} =$  \_\_\_\_\_.  
 (A) (0, 1, 0) (B) (0, 0, 1) (C) (1, 0, 0) (D) (0, 1, 1)
- h)  $|2i + j - 3k| =$  \_\_\_\_\_.  
 (A)  $\sqrt{14}$  (B) 14 (C) 0 (D)
- i) If  $\theta$  is the angle between the vectors  $\bar{x}$  and  $\bar{y}$  then  $\cos \theta =$  \_\_\_\_\_



(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)  $\frac{\bar{x} \times \bar{y}}{|\bar{x} \times \bar{y}|}$

j) Number of terms in the expansion of  $(5x+7y)^7 = \underline{\hspace{2cm}}$ .

(A) 9 (B) 8 (C) 6 (D) None of these

k)  $14C_{12} = \underline{\hspace{2cm}}$

(A) 156 (B) 19 (C) 91 (D) None of these

l)  $300^\circ = \underline{\hspace{2cm}}$  Radian

(A)  $\frac{5\pi}{2}$  (B)  $\frac{2\pi}{5}$  (C)  $\frac{3\pi}{5}$  (D)  $\frac{5\pi}{3}$

m)  $\frac{\pi}{12} = \underline{\hspace{2cm}}^\circ$ .

(A)  $15^\circ$  (B)  $12^\circ$  (C)  $25^\circ$  (D)  $10^\circ$

n)  $\operatorname{cosec}(-330^\circ) = \underline{\hspace{2cm}}$

(A)  $\frac{1}{2}$  (B)  $-\frac{1}{2}$  (C) -2 (D) 2

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

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

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

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

c) If  $A = \begin{bmatrix} 2 & 3 & 6 \\ -1 & 2 & 5 \end{bmatrix}$ ,  $B = \begin{bmatrix} 0 & 2 & -8 \\ 2 & 4 & -2 \end{bmatrix}$  and  $C = \begin{bmatrix} 1 & 3 & -3 \\ 1 & 4 & 1 \end{bmatrix}$  then prove that (4)

$$2A + 3B - 4C = 0.$$

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

a) For matrices  $A = \begin{bmatrix} 1 & 2 & 0 \\ 1 & 1 & 0 \\ -1 & 4 & 0 \end{bmatrix}$ ,  $B = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 1 & -1 \\ 2 & 2 & 2 \end{bmatrix}$  and  $C = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 1 & -1 \\ 1 & 1 & 1 \end{bmatrix}$  then show (5)

that  $AB = AC$ .

b) Using matrix method solve:  $2x - y = 4$  and  $3x + y = 1$  (5)

c) Solve:  $\frac{4 \log 3 \times \log x}{\log 9} = \log 27$  (4)

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

a) Forces  $(1, 2, 3)$ ,  $(-1, 2, 3)$  and  $(-1, 2, -3)$  act on a particles and the particle moves from the point  $(0, 1, -2)$  to  $(-1, 3, 2)$ . Find the work done by the forces. (5)

b) Find unit vector which is perpendicular to  $\vec{a} = i + j + k$  and  $\vec{b} = 2i - 2j + k$ . (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-5 Attempt all questions (14)**



a) If  $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$  then prove that  $A^2 - 5A + 7I = O$ . (5)

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

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

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

a) Find the middle term of  $\left(\frac{x}{2} + \frac{2}{y}\right)^{12}$ . (5)

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

c) If  $\vec{a} = (2, 1, 0)$ ,  $\vec{b} = (1, -1, 3)$  and  $\vec{c} = (3, 3, -1)$  then find modulus of  $\vec{a} + 2\vec{b} - 2\vec{c}$ . (4)

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

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

b) Prove that  $\tan 5A - \tan 3A - \tan 2A = \tan 5A \tan 3A \tan 2A$ . (5)

c) Using binomial theorem, find the approximate value of  $\frac{1}{\sqrt{9.18}}$ . (4)

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

a) Prove that  $\frac{\sin 3A}{\sin A} - \frac{\cos 3A}{\cos A} = 2$ . (5)

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

c) Prove that  $\tan^{-1}(\infty) + \sin^{-1}\left(\frac{\sqrt{3}}{2}\right) + \cos^{-1}\left(\frac{1}{2}\right) = \frac{7\pi}{6}$ . (4)

