

# C.U.SHAH UNIVERSITY

## Winter Examination-2015

Subject Name : Basic Mathematics

Subject Code : 2TE01BMT1

Branch : Diploma(All)

Semester :1 Date : 02/12 /2015 Time :10:30 To 1:30 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)  $\log(1+2+3+\cdots+n)$  (c)  $\log(1 \cdot 2 \cdot 3 \cdots n)$  (d) none of these
- b)  $\log 25 - \log 5 = \underline{\hspace{2cm}}$ .  
(a)  $\log 20$  (b)  $\log 5$  (c)  $\frac{\log 25}{\log 5}$  (d) none of these
- c)  $\log_a a + \log_b b = \underline{\hspace{2cm}}$ .  
(a) 0 (b) 1 (c) 2 (d) none of these
- d)  $4^{-\log_4 5} = \underline{\hspace{2cm}}$ .  
(a) 5 (b) 1 (c)  $4^{-1}$  (d)  $5^{-1}$
- e) The order of matrix  $\begin{bmatrix} 1 & 2 & 3 & 4 \end{bmatrix}$  is \_\_\_\_\_.  
(a)  $1 \times 4$  (b)  $4 \times 1$  (c)  $4 \times 4$  (d) none of these
- f) If  $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$  then  $A^T = \underline{\hspace{2cm}}$ .  
(a)  $\begin{bmatrix} 4 & 3 \\ 2 & 1 \end{bmatrix}$  (b)  $\begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix}$  (c)  $\begin{bmatrix} 4 & -2 \\ -3 & 1 \end{bmatrix}$  (d)  $\begin{bmatrix} 4 & -3 \\ -2 & 1 \end{bmatrix}$
- g) If two vectors a and b are perpendicular to each other then  $a \cdot b = \underline{\hspace{2cm}}$ .  
(a) -1 (b) 1 (c) 0 (d) none of these
- h) Magnitude of  $2i + j - 3k$  is \_\_\_\_\_.  
(a) 6 (b) 2 (c) 0 (d)  $\sqrt{14}$
- i)  ${}^{12}C_6 = \underline{\hspace{2cm}}$   
(a) 924 (b) 429 (c) 462 (d) 308
- 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)  $90^\circ = \underline{\hspace{2cm}}$  Radian  
 (a)  $\frac{\pi}{4}$  (b)  $\frac{\pi}{6}$  (c)  $\frac{\pi}{2}$  (d)  $\pi$
- l)  $\frac{3\pi}{2} = \underline{\hspace{2cm}}$  Degree  
 (a)  $120^\circ$  (b)  $135^\circ$  (c)  $180^\circ$  (d)  $270^\circ$
- m)  $\cos \frac{\pi}{2} \sin \frac{3\pi}{2} \sin \frac{5\pi}{2} = \underline{\hspace{2cm}}$   
 (a) 0 (b) 1 (c) -1 (d) none of these
- n)  $\sec^2 \theta - \tan^2 \theta = \underline{\hspace{2cm}}$   
 (a) 0 (b) 1 (c) -1 (d) none of these

**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) If  $\log\left(\frac{a+b}{2}\right) = \frac{1}{2}(\log a + \log b)$  then prove that  $a = b$ . (5)
- c) Prove that  $\log_{b^3} a^2 \cdot \log_{c^3} b^2 \cdot \log_{a^3} c^2 = \frac{8}{27}$  (4)

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

- a) Find the middle term of  $\left(\sqrt{x} - \frac{3}{x}\right)^6$ . (5)
- b) Find the constant term of  $\left(x - \frac{5}{x^3}\right)^8$ . (5)
- c) Find the approximate value of  $(101)^{\frac{3}{2}}$ . (4)

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

- a) 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  $2A + 3B - 4C = 0$ . (5)
- b) If  $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$  then prove that  $A^2 - 5A + 7I = 0$  (5)
- c) If  $A = \begin{bmatrix} 2 & -1 & 0 \\ 3 & 2 & -4 \\ 5 & 1 & 9 \end{bmatrix}$ ,  $B = \begin{bmatrix} 17 & -1 & 3 \\ -24 & -1 & -16 \\ -7 & 1 & 1 \end{bmatrix}$  and  $4A + 3C = B$ , then find the matrix C. (4)

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

- a) Solve the equations using matrix method:  $2x + 3y = 7$  and  $4x = 9 + y$  (5)



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

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

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

a) The constant forces  $3i + 2j + 5k$  and  $2i + j - 3k$  act on a particle, under the action of these forces particle moves from the point  $2i - j - 3k$  to the point  $4i - 3j + 7k$ . Find the total work done by forces. (5)

b) If  $x = i + j + k$  and  $y = 2i - j - k$  then prove that  $x$  is perpendicular to  $y$ . Also find an unit perpendicular to both  $x$  and  $y$ . (5)

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

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

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

b) Prove that  $\frac{\sin\left(\theta - \frac{\pi}{2}\right)}{\cos(\theta - \pi)} + \frac{\tan\left(\frac{\pi}{2} - \theta\right)}{\cot(\pi - \theta)} + \frac{\text{cosec}\left(\frac{\pi}{2} + \theta\right)}{\sec(\pi + \theta)} = -1$ . (5)

c) Prove that  $\tan 5A - \tan 3A - \tan 2A = \tan 5A \tan 3A \tan 2A$ . (4)

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

a) If  $\tan \theta = \frac{2}{3}$ ,  $0 \leq \theta \leq \frac{\pi}{2}$  then find value of  $2 \sin 2\theta + 3 \cos 2\theta$ . (5)

b) 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)

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

