Enrollment No: _____ **Exam Seat No:**_____

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) $\log 1 \cdot \log 2 \cdot \log 3 \cdots\cdots \log n =$ _____.

(a) 0 (b) $\log(1+2+3+\cdots\cdots+n)$ (c) $\log(1 \cdot 2 \cdot 3 \cdots\cdots n)$ (d) none of these

b) $\log 25 - \log 5 =$ _____.

(a) $\log 20$ (b) $\log 5$ (c) $\dfrac{\log 25}{\log 5}$ (d) none of these

c) $\log_a a + \log_b b =$ _____.

(a) 0 (b) 1 (c) 2 (d) none of these

d) $4^{-\log_4 5} =$ _____.

(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) 1×4 (b) 4×1 (c) 4×4 (d) none of these

f) If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ then $A^T =$ _____.

(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 $a \cdot b =$_____.

(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) $12C_6 =$_____

(a) 924 (b) 429 (c) 462 (d) 308

j) Number of terms in the expansion of $(5x+7y)^7 =$ _____.

(a) 9 (b) 8 (c) 6 (d) none of these

k) $90^\circ =$ _____ Radian

(a) $\frac{\pi}{4}$ (b) $\frac{\pi}{6}$ (c) $\frac{\pi}{2}$ (d) π

l) $\frac{3\pi}{2} =$ _____ Degree

(a) 120° (b) 135° (c) 180° (d) 270°

m) $\cos\frac{\pi}{2}\sin\frac{3\pi}{2}\sin\frac{5\pi}{2} =$ _____

(a) 0 (b) 1 (c) -1 (d) none of these

n) $\sec^2\theta - \tan^2\theta =$ _____

(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 $\log_{b^3} a^2.\log_{c^3} b^2.\log_{a^3} c^2=\frac{8}{27}$ **(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 $y=\sin\frac{x}{2}$, $(0\le x\le 2\pi)$. **(5)**

b) Prove that $\dfrac{\sin\left(\theta-\frac{\pi}{2}\right)}{\cos(\theta-\pi)}+\dfrac{\tan\left(\frac{\pi}{2}-\theta\right)}{\cot(\pi-\theta)}+\dfrac{\text{cosec}\left(\frac{\pi}{2}+\theta\right)}{\sec(\pi+\theta)}=-1$. **(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 $\tan\theta=\frac{2}{3}$, $0\le\theta\le\frac{\pi}{2}$ then find value of $2\sin 2\theta+3\cos 2\theta$. **(5)**

b) Prove that $\dfrac{\sin 4\theta+\sin 5\theta+\sin 6\theta}{\cos 4\theta+\cos 5\theta+\cos 6\theta}=\tan 5\theta$. **(5)**

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