

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) 2×3 (B) 3×2 (C) 2×2 (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 θ 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° (B) 12° (C) 25° (D) 10°

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)

