

C.U.SHAH UNIVERSITY

Summer Examination-2018

Subject Name : Basic Mathematics

Subject Code : 2TE01BMT1

Branch: Diploma (All)

Semester : 1

Date : 21/03/2018

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) $\log 1 \cdot \log 2 \cdot \log 3 \cdots \log n = \underline{\hspace{2cm}}$
 (A) 0 (B) 1 (C) $\log(1+2+3+\dots+n)$ (D) None of these
- b) $4^{-\log_4 5} = \underline{\hspace{2cm}}$
 (A) 5 (B) $\frac{1}{5}$ (C) $\frac{5}{4}$ (D) $\frac{4}{5}$
- c) $\frac{\log 49}{\log 7} = \underline{\hspace{2cm}}$
 (A) 7 (B) $\log 7$ (C) 2 (D) None of these
- d) If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ then $A^T = \underline{\hspace{2cm}}$.
 (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) $\begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix}$
- e) If $A = \begin{bmatrix} -8 & 4 \\ -6 & 3 \end{bmatrix}$ then $A^{-1} = \underline{\hspace{2cm}}$.
 (A) $\begin{bmatrix} -8 & 4 \\ -6 & 3 \end{bmatrix}$ (B) $\begin{bmatrix} -3 & 4 \\ -6 & 8 \end{bmatrix}$ (C) $\begin{bmatrix} -8 & -6 \\ 4 & 3 \end{bmatrix}$ (D) Does not exist
- f) If $\begin{vmatrix} x & -2 \\ 3 & -5 \end{vmatrix} = -4$ then $x = \underline{\hspace{2cm}}$.
 (A) -2 (B) 2 (C) -5 (D) 5
- g) $|2i + j - 3k| = \underline{\hspace{2cm}}$.
 (A) $\sqrt{14}$ (B) $\sqrt{13}$ (C) $\sqrt{41}$ (D) 4
- h) 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
- i) If θ is the angle between the vectors \bar{x} and \bar{y} then $\sin \theta = \underline{\hspace{2cm}}$



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

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

(A) 6 (B) 5 (C) 4 (D) None of these

k) $\frac{5\pi}{6} =$ _____°.

(A) 160° (B) 155° (C) 150° (D) 145°

l) $300^\circ =$ _____ Radian

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

m) $\sin(-225^\circ) =$ _____.

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

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

(A) -1 (B) 0 (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 $\frac{1}{\log_6 24} + \frac{1}{\log_{12} 24} + \frac{1}{\log_8 24} = 2$.

(5)

b) Prove that $\log_{10} 800 = 2 + 3\log_{10} 2$.

(5)

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-3

Attempt all questions

(14)

a) 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

(5)

$2(X + A) + 3B = 0$.

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) Forces $\vec{F}_1 = i + 2j - 3k$ and $\vec{F}_2 = i - j + 2k$ act on a particle under the

(5)

influence of these forces, particle moves from point $(3, 1, 2)$ to $(1, 3, -1)$. Find the work done.

b) Prove that the angle between two vectors $i + 2j$ and $i + j + 3k$ is $\sin^{-1}\left(\sqrt{\frac{46}{55}}\right)$.

(5)

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

(4)



Q-5 Attempt all questions (14)

a) If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ then prove that $A^2 - 5A - 2I = O$. (5)

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

c) Prove that $\frac{\cos(90^\circ - A)\cos(180^\circ - A)\tan(180^\circ + A)}{\sin(90^\circ - A)\sin(180^\circ - A)\tan(180^\circ - A)} = 1$. (4)

Q-6 Attempt all questions (14)

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

b) Find the middle term of $\left(\frac{x^2}{3} + \frac{2}{x^3}\right)^{10}$. (5)

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

Q-7 Attempt all questions (14)

a) Prove that $\frac{\cos 4\theta + 2\cos 5\theta + \cos 6\theta}{\sin 4\theta + 2\sin 5\theta + \sin 6\theta} = \cot 5\theta$. (5)

b) Prove that $\tan 10^\circ + \tan 35^\circ + \tan 10^\circ \tan 35^\circ = 1$. (5)

c) Using binomial theorem, find the approximate value of $\frac{1}{\sqrt[3]{997}}$. (4)

Q-8 Attempt all questions (14)

a) Prove that $\frac{\sin A + \sin 2A}{1 + \cos A + \cos 2A} = \tan A$. (5)

b) Draw the graph of $y = \cos x$ $\left(-\frac{\pi}{2} \leq x \leq \frac{\pi}{2}\right)$. (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)

