

C.U.SHAH UNIVERSITY

Summer Examination-2019

Subject Name : Basic Mathematics

Subject Code : 2TE01BMT1

Semester : 1

Date : 14/03/2019

Branch: Diploma (All)

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) $2^{-\log_2 5} = \underline{\hspace{2cm}}$
 (A) 5 (B) $\frac{1}{5}$ (C) $\frac{5}{2}$ (D) $\frac{2}{5}$
- c) $\frac{\log 36}{\log 6} = \underline{\hspace{2cm}}$
 (A) 6 (B) $\log 6$ (C) 2 (D) None of these
- d) If $x + \begin{bmatrix} -3 & 2 \\ 5 & 7 \end{bmatrix} = \begin{bmatrix} -2 & 4 \\ 8 & 11 \end{bmatrix}$ then $x = \underline{\hspace{2cm}}$.
 (A) $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ (B) $\begin{bmatrix} -1 & -2 \\ -3 & -4 \end{bmatrix}$ (C) $\begin{bmatrix} -1 & 2 \\ 3 & -4 \end{bmatrix}$ (D) $\begin{bmatrix} 1 & -2 \\ -3 & 4 \end{bmatrix}$
- e) If $A = \begin{bmatrix} 3 & 7 \\ 2 & 5 \end{bmatrix}$ then $A + A^T = \underline{\hspace{2cm}}$.
 (A) $\begin{bmatrix} 6 & 10 \\ 9 & 9 \end{bmatrix}$ (B) $\begin{bmatrix} 6 & 9 \\ 10 & 9 \end{bmatrix}$ (C) $\begin{bmatrix} 10 & 9 \\ 9 & 6 \end{bmatrix}$ (D) $\begin{bmatrix} 6 & 9 \\ 9 & 10 \end{bmatrix}$
- f) Order of $\begin{bmatrix} 2 \\ 5 \end{bmatrix}$ is $\underline{\hspace{2cm}}$.
 (A) 2×2 (B) 2×1 (C) 3×2 (D) None of these
- g) 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
- h) If θ is the angle between the vectors \bar{x} and \bar{y} then $\cos \theta = \underline{\hspace{2cm}}$
 (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) $\frac{\bar{x} \times \bar{y}}{|\bar{x} \times \bar{y}|}$



- i) Magnitude of $2i + j - 3k$ is _____.
 (A) 6 (B) 2 (C) 0 (D) $\sqrt{14}$
- j) Number of terms in the expansion of $(5x + 7y)^6 =$ _____.
 (A) 9 (B) 8 (C) 7 (D) 6
- k) $12C_5 =$ _____.
 (A) 729 (B) 792 (C) 297 (D) 927
- l) $\frac{3\pi}{2} =$ _____ Degree
 (A) 120° (B) 135° (C) 180° (D) 270°
- m) $270^\circ =$ _____ Radian
 (A) $\frac{3\pi}{4}$ (B) $\frac{3\pi}{2}$ (C) 7π (D) 4π
- n) $\sin(-225^\circ) =$ _____.
 (A) $\frac{1}{\sqrt{2}}$ (B) $-\frac{1}{\sqrt{2}}$ (C) $-\sqrt{2}$ (D) $\sqrt{2}$

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) Prove that $\log_{10} 800 = 2 + 3\log_{10} 2$. (5)
- c) If $A = \begin{bmatrix} 1 & 2 & 1 \\ 3 & 4 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 3 & -2 & 4 \\ 1 & 5 & 0 \end{bmatrix}$ then find matrix X from $X + A + B = 0$. (4)

Q-3 Attempt all questions (14)

- a) If $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ then prove that $A^2 - 5A + 7I = 0$. (5)
- 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) Constant forces $3i - j + 2k$ and $i + 3j - k$ act on a particle and the particle moves from the point $2i + 3j + k$ to the point $5i + 2j + 3k$. Find the work done by the forces. (5)
- b) Prove that angle between two vectors $i + 2j$ and $i + j + 3k$ is (5)

$$\sin^{-1}\left(\sqrt{\frac{46}{55}}\right).$$

- 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-5 Attempt all questions (14)



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

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

c) Evaluate: $\tan\left(2 \tan^{-1} \frac{1}{3}\right)$ (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 constant term of $\left(x - \frac{5}{x^3}\right)^8$. (5)

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

Q-7 Attempt all questions (14)

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

b) Prove that $\tan 20^\circ + \tan 25^\circ + \tan 20^\circ \tan 25^\circ = 1$. (5)

c) Prove that $(\sqrt{3}+1)^4 + (\sqrt{3}-1)^4 = 56$ using binomial theorem. (4)

Q-8 Attempt all questions (14)

a) If $\tan \theta = \frac{1}{2}$, prove that $7 \cos 2\theta + 8 \sin 2\theta = \frac{53}{5}$. (5)

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

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

