

C. U. SHAH UNIVERSITY

Summer Examination-2020

Subject Name : Basic Mathematics

Subject Code : 2TE01BMT1

Branch: Diploma (All)

Semester : 1

Date : 26/02/2020

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) $\log_{10} 0.0001 = \underline{\hspace{2cm}}$
 (A) -4 (B) 1 (C) 0 (D) 4
- b) $4^{-\log_4 5} = \underline{\hspace{2cm}}$
 (A) 5 (B) $\frac{1}{5}$ (C) $\frac{5}{2}$ (D) $\frac{2}{5}$
- c) $\frac{\log \sqrt[3]{36}}{\log \sqrt{6}} = \underline{\hspace{2cm}}$
 (A) 6 (B) $\log 6$ (C) $\frac{4}{3}$ (D) $\frac{3}{4}$
- d) If $\begin{vmatrix} x & -2 \\ 3 & -5 \end{vmatrix} = -4$ then $x = \underline{\hspace{2cm}}$.
 (A) $-\frac{2}{5}$ (B) $\frac{2}{5}$ (C) -2 (D) 2
- e) If $A = \begin{bmatrix} 1 & 2 \\ 3 & 1 \\ 4 & 2 \end{bmatrix}$ then $A^T = \underline{\hspace{2cm}}$.
 (A) $\begin{bmatrix} 2 & 1 \\ 1 & 3 \\ 2 & 4 \end{bmatrix}$ (B) $\begin{bmatrix} 1 & 3 & 4 \\ 2 & 1 & 2 \end{bmatrix}$ (C) $\begin{bmatrix} 1 & 2 \\ 3 & 1 \\ 4 & 2 \end{bmatrix}$ (D) None of these
- f) Order of matrix $\begin{bmatrix} 1 & 2 & 5 \\ 2 & 3 & 7 \end{bmatrix}$ is $\underline{\hspace{2cm}}$.
 (A) 2×3 (B) 3×2 (C) 2×2 (D) None of these
- g) $-3(5, -1, -2) + 8(1, 1, 0) = \underline{\hspace{2cm}}$
 (A) (7, 11, 6) (B) (7, -11, 6) (C) (7, 11, -6) (D) (-7, 11, 6)
- h) If $\vec{a} = i + j - k$ then $\hat{a} = \underline{\hspace{2cm}}$



(A) $\frac{(1,-1,1)}{\sqrt{3}}$ (B) $\frac{(-1,1,1)}{\sqrt{3}}$ (C) $\frac{(1,1,-1)}{\sqrt{3}}$ (D) $\sqrt{3}$

- i) $(2, -1, 3) \times (-4, 2, -6) = \underline{\hspace{2cm}}$.
 (A) $(-8, -2, -18)$ (B) $(8, 2, 18)$ (C) $(0, 0, 0)$ (D) None of these
- j) Number of terms in the expansion of $(4x + y)^5 = \underline{\hspace{2cm}}$.
 (A) 4 (B) 5 (C) 6 (D) 7
- k) ${}^{25}C_{22} = \underline{\hspace{2cm}}$
 (A) 2300 (B) 230 (C) 575 (D) 275
- l) $\frac{\pi}{4}$ Radian = $\underline{\hspace{2cm}}$ Degree
 (A) 60° (B) 30° (C) 45° (D) 90°
- m) $20^\circ = \underline{\hspace{2cm}}$ Radian.
 (A) $\frac{\pi}{2}$ (B) $\frac{3\pi}{2}$ (C) $\frac{\pi}{9}$ (D) $\frac{\pi}{3}$
- n) $\tan\left(\frac{21\pi}{4}\right) = \underline{\hspace{2cm}}$
 (A) $\frac{-1}{\sqrt{3}}$ (B) $\frac{1}{\sqrt{3}}$ (C) 1 (D) $\sqrt{3}$

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) If $\log\left(\frac{a-b}{2}\right) = \frac{1}{2}(\log a + \log b)$ then prove that $a^2 + b^2 = 6ab$. (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-3 Attempt all questions (14)

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

b) Using matrix method solve: $2x + 3y = 7$ and $4x = 9 + y$ (5)

c) Solve: $\log_2(x+5) + \log_2(x-2) = 3$ (4)

Q-4 Attempt all questions (14)

a) A particle moves from the point $-i - j - k$ to the point $k + j + i$ under the effect of two constant forces $2i + j + k$ and $i + 3j + k$. Find the work done. (5)

b) Find unit vector which is perpendicular to $\vec{a} = 5i + 7j - 2k$ and $\vec{b} = j - 2k + 3i$. (5)



c) If $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 2 \\ 2 & 1 \\ 1 & 2 \end{bmatrix}$ then find AB and BA (4)

Q-5 Attempt all questions (14)

a) If $A = \begin{bmatrix} 2 & 1 & 5 \\ 0 & 3 & -1 \\ 2 & 5 & 0 \end{bmatrix}$ then find adjA. (5)

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

c) Evaluate: $\sin\left(2 \tan^{-1} \frac{1}{3}\right)$ (4)

Q-6 Attempt all questions (14)

a) Find the 7th term of $\left(\frac{4x}{5} - \frac{5}{2x}\right)^9$. (5)

b) Find the middle term of $\left(2x^2 + \frac{1}{3x}\right)^6$. (5)

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

Q-7 Attempt all questions (14)

a) Prove that $\frac{\sin 4x + \sin 5x + \sin 6x}{\cos 4x + \cos 5x + \cos 6x} = \tan 5x$. (5)

b) Prove that $\tan 62^\circ = \frac{\cos 17^\circ + \sin 17^\circ}{\cos 17^\circ - \sin 17^\circ}$. (5)

c) Find the approximate value of $\sqrt[3]{1003}$ and $\frac{1}{4.95}$. (4)

Q-8 Attempt all questions (14)

a) Prove that $\cos 4\theta = 8\cos^4\theta - 8\cos^2\theta + 1$. (5)

b) Draw the graph of $y = 2\cos x$ ($0 \leq x \leq \pi$). (5)

c) Prove that $\sin^{-1}\left(\frac{3}{5}\right) + \tan^{-1}\left(\frac{4}{3}\right) = \frac{\pi}{2}$. (4)

