[80/A-13]

SEAT No.________

No. of Printed Pages : 3

# SARDAR PATEL UNIVERSITY

B.SC. SEM-I (NC) EXAMINATION

$30^{th}$ October 2018 , Tuesday

02.00 p.m. to 04.00 pm

US01EMTH02

(Mathematics)

Maximum Marks: 70

**Q.1** Choose the correct option in the following questions, mention the correct option in the answerbook. [10]

(1) Principle diagonal entries of skew-symmetric matrix are . . . . . . . . . . . .

(a) Real (b) Complex (c) Zero (d) None

(2) Inverse of $(0, -1) =$ . . . . . . . . . . . .

(a) (0,1) (b) (1,0) (c) (−1,0) (d) (0,0)

(3) Conjugate of $z = -8 + 2i$ is. . . . . . . . . . . .

(a) $-8 - 2i$ (b) $-4 + i$ (c) $8 + 2i$ (d) $8 - 2i$

(4) Range of the constant function is . . . . . . . . . . . .

(a) Empty set (b) singleton set (c) $\mathbb{Z}$ (d) $\mathbb{N}$

(5) If $f : \mathbb{N} \to \mathbb{N}$ defined by $f(x) = x^2$ and $g : \mathbb{N} \to \mathbb{N}$ defined by $g(x) = x^3$ then fog(x)=. . . . . . . . . . . .

(a) $x^5$ (b) $x^4$ (c) $x^6$ (d) None

(6) Measure of angle between $\bar{i}$ and $\bar{j}$ is. . . . . . . . . . . .

(a) $\frac{\pi}{2}$ (b) $\frac{\pi}{4}$ (c) 0 (d) $\frac{\pi}{3}$

(7) If $\Delta = 0$ then quadratic equation has . . . . . . . . . . . .

(a) Two complex root (b) Two equal root (c) Two real root (d) none

(8) $|(\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}})| =$ . . . . . . . . . . . .

(a) $\frac{1}{\sqrt{3}}$ (b) $\frac{1}{3}$ (c) $-1$ (d) 1

(9) If $x = \log_5(125)$ then $x =$ . . . . . . . . . . . .

(a) 4 (b) 2 (c) 3 (d) 5

(10) $\begin{vmatrix} 1 & 2 & 3 \\ 1 & 2 & 3 \\ 1 & 1 & 1 \end{vmatrix} =$ . . . . . . . . . . . .

(a) 4 (b) −1 (c) 0 (d) 1

**Q.2** Attempt any ten in short: [20]

(1) Find value of sin $150^0$ and tan $\left(\frac{3\pi}{4}\right)$.

(2) Define Transpose of a matrix.

(3) Evaluate $(2, 3, 1) \times (1, 2, 3)$.

(PTO)

(4) Express $2^7 = 128$ and $8^0 = 1$ in Logarithmic form.
(5) Find range of the function $f : \mathbb{N} \to \mathbb{N}$ defined by $f(x) = x - [x]$.
(6) Define vector and unit vector.
(7) Solve : $2x + 3y = 7$ ; $4x - y = 9$ .
(8) Is the function $f : \mathbb{R} \to \mathbb{R}$ defined by $f(x) = x^2$ is one one ?.
(9) Find $\alpha \in \mathbb{C}$ which satisfy $(5, 6) + \alpha = (2, -1)$.
(10) If $\overline{x} = (1, 1, 1)$ , $\overline{y} = (1, 0, 0)$ then find $\overline{x} - \overline{y}$.
(11) Express $i^9 + i^{10} + i^{11} - 3i^{12}$ in $a + ib$ form.
(12) If $A = \begin{bmatrix} 2 & 3 \\ 4 & 1 \end{bmatrix}$ then find $A + A^T$ . Is it symmetric .

**Q.3**

(a) If $f : \mathbb{N} \to \mathbb{N}$ defined by $f(x) = x^2$ and $g : \mathbb{N} \to \mathbb{N}$ defined by $g(x) = x^3$ then find fog and gof . [5]

(b) Solve: (i) $3\left(x^2 + \frac{1}{x^2}\right) + 16\left(x + \frac{1}{x}\right) + 26 = 0$
(ii) $\sqrt{4x+1} + \sqrt{x+1} = 3$ [5]

**OR**

**Q.3**

(c) Find conjugate and Modulus of following : [5]
(i) $(2 + 7i)^3$ (ii) $\frac{(8 - 3i)(6 - i)}{2 - 2i}$

(d) Define one-one and onto function. Check which of the following function are one - one and onto? [5]
(i) $f : \mathbb{R} \to \mathbb{R}$ defined by $f(x) = x^2 - 4x + 5$
(ii) $f : \mathbb{R} \to \mathbb{R}$ defined by $f(x) = x + |x|$.

**Q.4**

(a) Prove that $\left(\frac{1 - \tan\theta}{1 - \cot\theta}\right)^2 = \frac{1 + \tan^2\theta}{1 + \cot^2\theta}$. Also, find the value of $\tan\left(\frac{-17\pi}{4}\right)$. [5]

(b) Simplify the following :
(i) $7log(8/5) - 6log(4/15) + 3log(5/72)$ [5]
(ii) $log(a^2/bc) + log(b^2/ca) + log(c^2/ab)$.

**OR**

**Q.4**

(c) If $\sin\theta + \operatorname{cosec}\theta = 2$ then prove that $\sin^n\theta + \operatorname{cosec}^n\theta = 2$ , $n \in \mathbb{N}$. [5]

(d) Solve the following :
(i) $x^{log_9 x} = 81x$ (ii) $log_x 4 + log_x 16 + log_x 64 = 12$ [5]

**Q.5**

(a) Solve $3x + 2y = 13xy$ ; $-2x + 5y = 4xy$ by using Cremer's rule. [5]

(b) If $A = \begin{bmatrix} 1 & -1 \\ 0 & 2 \end{bmatrix}$ , $B = \begin{bmatrix} -1 & 0 \\ 2 & 1 \end{bmatrix}$ , $C = \begin{bmatrix} 0 & 1 \\ 1 & -1 \end{bmatrix}$ [5]
then prove that $A(B + C) = AB + AC$ .

**OR**

**Q.5**

(c) Prove that

$$\begin{vmatrix} x^2 & y^2 & z^2 \\ x & y & z \\ 1 & 1 & 1 \end{vmatrix} = -(x-y)(y-z)(z-x).$$

[5]

(d) If $A = \begin{bmatrix} 2 & 3 \\ 5 & -2 \end{bmatrix}$ then prove that $A^{-1} = \frac{1}{19}A$. [5]

**Q.6**

(a) If $\overline{x} = (1, 0, 0)$ , $\overline{y} = (0, 1, 1)$ , $\overline{z} = (1, 1, 1)$ then find $[\overline{x}, \overline{y}, \overline{z}]$. [5]

(b) Define vector and unit vector. Find direction cosines of the (1,1,1) ; (0,1,1) ; (2,2,1) ; $\overline{i} + \overline{j}$ ; $3\overline{i} + 4\overline{j} - 2\overline{k}$. [5]

**OR**

**Q.6**

(c) If $(2a, a, -4)$ and $(a, -2, 1)$ are orthogonal then find $a$ . [5]

(d) Solve: $5x + 8y + z = 2; 2y + z = -1; 4x + 3y - z = 3$. [5]

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