BSc-1

[40]

No. of printed pages: 3

**SARDAR PATEL UNIVERSITY**
**BSc. (I Semester) (CBCS) Examination**
**Friday, 22nd April, 2016**
**2.30 – 4.30 pm**
**US01EMTH02 – Mathematics**

**Total Marks: 70**

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

(1) symmetric matrix means $A^T = \ldots\ldots\ldots\ldots$
(a) $-A$ (b) $A$ (c) $A^{-1}$ (d) None of these

(2) If $z = -3 - 4i$ then $\mid z \mid = \ldots\ldots\ldots\ldots$
(a) 4 (b) 3 (c) 5 (d) 25

(3) Value of $i^{15} = \ldots\ldots\ldots\ldots$
(a) 1 (b) $i$ (c) $-i$ (d) $-1$

(4) If $\overline{x} = (a, -1), \overline{y} = (-a, -1)$ and $\overline{x} \perp \overline{y}$ then $a = \ldots\ldots\ldots\ldots$
(a) 2 (b) $-\sqrt{2}$ (c) 0 (d) 1

(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)=$\ldots\ldots\ldots\ldots$
(a) $x^5$ (b) $x^4$ (c) $x^6$ (d) None of these

(6) Measure of angle between $\overline{i}$ and $\overline{j}$ is$\ldots\ldots\ldots\ldots$
(a) $\frac{\pi}{2}$ (b) $\frac{\pi}{4}$ (c) 0 (d) $\frac{\pi}{3}$

(7) If $\frac{-b \pm \sqrt{\Delta}}{2a}$ is solution of quadratic equation than $\Delta = \ldots\ldots\ldots\ldots$
(a) $c^2 - 4ac$ (b) $a^2 - 4bc$ (c) $b^2 - 4ac$ (d) 0

(8) Exponential form of $\log_{10} 1000 = 3$ is$\ldots\ldots\ldots\ldots$
(a) $3^{10} = 1000$ (b) $10^3 = 1000$ (c) $1000^{10} = 3$ (d) $10^{1000} = 3$

(9) $\begin{vmatrix} 1 & 2 & 3 \\ 1 & 2 & 3 \\ 1 & 1 & 1 \end{vmatrix} = \ldots\ldots\ldots\ldots$
(a) 4 (b) $-1$ (c) 0 (d) 1

(10) $\log_a a = \ldots\ldots\ldots\ldots$
(a) 0 (b) 1 (c) $-1$ (d) 2

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

(1) Find $\alpha \in \mathbb{C}$ which satisfy $(-4, 6) + \alpha = (3, 7)$.

(2) Define Determinant of order $3 \times 3$ .

(P.T.O)

(3) Express $\left(\frac{1}{2} - 2i\right)^2$ in a + i b form.

(4) Express $9^{7/2} = 2187$ and $5^0 = 1$ in Logarithmic form.

(5) Find range of the following function $f : \mathbb{N} \to \mathbb{N}$ defined by $f(x) = x^2$.

(6) Find value of sin 135 and $\tan\left(\frac{3\pi}{4}\right)$.

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

(8) Define : Quadractic equation.

(9) Prove that

$$\begin{vmatrix} 0 & -x & -y \\ x & 0 & z \\ y & z & 0 \end{vmatrix} = 0$$

(10) If $\overline{x} = (2, 0, 1)$ , $\overline{y} = (1, 2, 4)$ then find $5\overline{x} + 3\overline{y}$.

(11) Define: Vector and unit vector.

(12) If $A = \begin{bmatrix} 1 & -1 & 4 \\ 2 & 6 & 5 \end{bmatrix}$ , $B = \begin{bmatrix} -2 & 6 & 3 \\ 0 & 2 & 7 \end{bmatrix}$ then find $A + B$ and $A - B$.

Q.3

(a) If $f : \mathbb{R} \to \mathbb{R}$ defined by $f(x) = x^2 + 1$ and $g : \mathbb{R} \to \mathbb{R}$ defined by $g(x) = 2x + 1$ then find fog and gof . [5]

(b) Solve: (i) $\frac{1}{x-3} - \frac{2}{x+4} = \frac{1}{x+6}$ (ii) $\sqrt{4x+1} + \sqrt{x+1} = 3$ [5]

OR

Q.3

(c) Find conjugate and Modulus of following : [5]

(i) $(3 - 7i)^2$ (ii) $\frac{1-i}{1+i}$

(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 $f(x) = x^2$.

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) Solve the following :

(i) $log_x 4 + log_x 16 + log_x 64 = 12$ (ii) $logx - log(x - 1) = log3$ [5]

OR

Q.4

(c) Prove that $\sin\left(\frac{10\pi}{3}\right)\cos\left(\frac{11\pi}{6}\right)+\cos\left(\frac{2\pi}{3}\right)\sin\left(\frac{5\pi}{6}\right)=1$ [5]

(d) Simplify the following :

(i) $\log(11/15)+\log(490/297)-2\log(7/9)$ [5]

(ii) $\log_b a \times \log_c b \times \log_a c$.

Q.5

(a) Solve $x+2y=3$ ; $4x+8y=12$ 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

$$\begin{vmatrix} b^2+c^2 & c^2+a^2 & a^2+b^2 \\ a^2 & b^2 & c^2 \\ 1 & 1 & 1 \end{vmatrix} = 0.$$

[5]

(d) If $A=\begin{bmatrix}3 & 1\\ -1 & 2\end{bmatrix}$ then prove that $A^2-5A+7I_2=0$ . [5]

Q.6

(a) If the measure of the angle between $\bar{i}+\sqrt{3}\,\bar{j}$ and $\sqrt{3}\,\bar{i}+a\bar{j}$ is $\pi/3$ then find $a$. [5]

(b) Solve the following : [5]

(i) $x(3,1)+y(4,2)=(1,0)$

(ii) $x(1,1)+y(2,1)=(3,2)$

OR

Q.6

(c) If $\overline{x}=(1,1,1)$ , $\overline{y}=(1,2,5)$ , $\overline{z}=(1,2,3)$ then find $(5\overline{x}+2\overline{y})\cdot\overline{z}$ and $\overline{x}\times\overline{y}$. [5]

(d) Define vector and unit vector. Find direction cosines of the [5]

(1,1,1) ; (0,1,1) ; (2,2,1) ; $\bar{i}+\bar{j}$ ; $3\bar{i}+4\bar{j}-2\bar{k}$.