

[3/A-2]

B.Sc. (I-Semester) ON DEMAND EXAMINATION 2022

Thursday, 29th September 2022

09:30am-11:30am

US01EMTH 02-Mathematics

MATHEMATICS



Total Marks: 70

Note: Figures to the right indicates full marks of question.

Q: 1 Answer the following by selecting the correct answer from the given options: [10]

1. If $z = -4 + 3i$ then $|z| =$ -----
 a. 4 b. 3 c. 5 d. 6
2. $f: N \rightarrow N$ defined by $f(x) = 2x + 1$ then co-domain of function $f =$ -----
 a. $\{1,3,5,7, \dots\}$ b. $\{3,5,7, \dots\}$ c. $\{1,3,5,7, \dots\}$ d. $\{2,4,6,8, \dots\}$
3. If $\frac{-b \pm \sqrt{\Delta}}{2a}$ is a solution of quadratic equation then $\Delta =$ -----
 a. $c^2 - 4ab$ b. $a^2 - 4cb$ c. $b^2 - 4ac$ d. 0
4. The range of sec function is -----
 a. R b. $R - (-1,1)$ c. $[0,1]$ d. $[-1,1]$
5. If $x = \log_5 125$ then $x =$ -----
 a. 4 b. 2 c. 3 d. 5
6. Exponential form of $\log_{10} 1000 = 3$ is -----
 a. $3^{10} = 1000$ b. $10^3 = 1000$ c. $1000^{10} = 3$ d. $10^{1000} = 3$
7. $\begin{vmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{vmatrix} =$ -----
 a. $\cos^2\theta - \sin^2\theta$ b. 0 c. 1 d. None of these
8. If $A = \begin{bmatrix} 2 & 3 \\ 4 & -1 \end{bmatrix}$ then $\text{adj}A =$ -----
 a. $\begin{bmatrix} -1 & -3 \\ -4 & 2 \end{bmatrix}$ b. $\begin{bmatrix} -1 & 3 \\ 4 & -2 \end{bmatrix}$ c. $\begin{bmatrix} -2 & -3 \\ -4 & -1 \end{bmatrix}$ d. $\begin{bmatrix} -2 & -3 \\ -4 & 1 \end{bmatrix}$
9. If $\bar{x} = (\cos\alpha, \sin\alpha)$, $\bar{y} = (\cos\beta, \sin\beta)$ then $|\bar{x}| + |\bar{y}| =$ -----
 a. 1 b. 0 c. 2 d. -1
10. If $\bar{x} = (k, -1)$, $\bar{y} = (-k, -4)$ and $\bar{x} \perp \bar{y}$ then $k =$ -----
 a. 2 b. $-\sqrt{2}$ c. 0 d. 1

Q: 2 Do as directed:**[08]**

- (1) The value of $(i)^{25} = \dots\dots\dots$
- (2) Conjugate of $z = -8 + 2i = \dots\dots\dots$
- (3) True or False: The value of $\sin 150^\circ$ is $\frac{1}{2}$.
- (4) True or False: Zero's of *cosin* function is $\{k\pi/k \in Z\}$.
- (5) True or False: $A = \begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix}$ is diagonal matrix.
- (6) True or False: The value of $\begin{vmatrix} 2 & -1 \\ -3 & 5 \end{vmatrix}$ is 7.
- (7) For $\bar{x} = (x_1, x_2, x_3) \in R^3$ then $\bar{x} \times \bar{x} = \dots\dots\dots$
- (8) Direction of $(1,0,0)$ and $(-1,0,0)$ are $\dots\dots\dots$

Q: 3 Answer in brief of the following questions. (Any Ten)**[20]**

1. Find the range of function $f: N \rightarrow N$ defined by $f(x) = \frac{1}{x^2}$.
2. Find inverse of a complex number $(3, -4)$.
3. Is of function $f: N \rightarrow N$ defined by $f(x) = 2x - 1$ on-to? Verify it.
4. Find the value of $\cos\left(\frac{-11\pi}{3}\right)$.
5. Simplify: $\log_e\left(\frac{a^2}{bc}\right) + \log_e\left(\frac{b^2}{ac}\right) + \log_e\left(\frac{c^2}{ab}\right)$
6. Express $2^7 = 128$ and $8^0 = 1$ in logarithmic form.
7. 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 $A - B$.
8. If $A = \begin{bmatrix} 1 & 5 \\ 7 & 3 \end{bmatrix}$ then find $A + A^T$. Is it symmetry?
9. Prove that $\begin{vmatrix} 0 & -x & -y \\ x & 0 & z \\ y & -z & 0 \end{vmatrix} = 0$.
10. Evaluate: $(2,3,1) \times (-1,2,-3)$
11. Solve: $x(1,1) + y(2,1) = (3,2)$
12. If $\bar{x} = (1,0,0)$, $\bar{y} = (0,1,1)$, $\bar{z} = (1,1,1)$ then find $[\bar{x}, \bar{y}, \bar{z}]$

Q: 4 Attempt any Four of the following:**[32]**

- (1) If $f: R \rightarrow R$ defined by $f(x) = x^2 + x + 1$, $g: R \rightarrow R$ defined by $g(x) = x - 1$, $h: R \rightarrow R$ defined by $h(x) = 2x$, then find $fog, foh, fo(goh), (fog)og, gog, hoh, fof$.
- (2) Solve: $3\left(x^2 + \frac{1}{x^2}\right) + 16\left(x + \frac{1}{x}\right) + 26 = 0$
- (3) Solve: $\log_{10}(7x - 9)^2 + \log_{10}(3x - 4)^2 = 2$
- (4) 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) Solve $3x + 2y = 13xy$, $-2x + 5y = 4xy$ by using Cremer's rule.
- (6) If $A = \begin{bmatrix} -1 & -1 \\ 0 & 2 \end{bmatrix}$, $B = \begin{bmatrix} -1 & 0 \\ 2 & 1 \end{bmatrix}$, $C = \begin{bmatrix} 0 & -1 \\ 1 & -1 \end{bmatrix}$ then prove that $A(B - C) = AB - AC$.
- (7) Find the direction angles of $(1, -1, 0)$; $(0, 1, 1)$.
- (8) If $\bar{x} = (1, 1, 2)$, $\bar{y} = (1, 2, 1)$, $\bar{z} = (2, 1, 1)$ then find $\bar{x} \times (\bar{y} \times \bar{z})$.