Vnr12M

Virudhunagar District

First Revision Exam, January - 2025

Standard 12

MATHS

Time: 3.00 Hours Marks: 90

PART - I

Answer all the questions.

Choose the correct answer from the given four alternatives: **20×1=20**

1) If adj A = $\begin{matrix} 2 & 3 \\ 4 & -1 \end{matrix}$ and adj B = $\begin{matrix} 1 & -2 \\ -3 & 1 \end{matrix}$ then adj (AB) is

a) $\begin{matrix} -7 & -1 \\ 7 & -9 \end{matrix}$ b) $\begin{matrix} -6 & 5 \\ -2 & -10 \end{matrix}$ c) $\begin{matrix} -7 & 7 \\ -1 & -9 \end{matrix}$ d) $\begin{matrix} -6 & -2 \\ 5 & -10 \end{matrix}$

2) The solution of the equation $|z|-z = 1+2zi$ is ......

a) $3/2 - 2i$ b) $-3/2 + 2i$ c) $2 + 3/2\, i$ d) $2 - 3/2\, i$

3) The number of real numbers in $[0, 2\pi]$ satisfying $\sin^4 x - 2\sin^2 x + 1$ is

a) 2 b) 4 c) 1 d) ∞

4) If $x = 1/5$ the value of $\cos[\cos^{-1}x + 2\sin^{-1}x] = ...$

a) $-\sqrt{24/25}$ b) $\sqrt{24/25}$ c) $-1/5$ d) $1/5$

5) The area of quadrilateral formed with foci of the hyperbolas $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ and $\frac{x^2}{a^2} - \frac{y^2}{b^2} = -1$ is .....

a) $4(a^2+b^2)$ b) $2(a^2+b^2)$ c) a^2+b^2 d) $½(a^2+b^2)$

6) The angle between the line $\vec{r} = (\vec{i} + 2\vec{j} - 3\vec{k}) + t(2\vec{i} + \vec{j} - 2\vec{k})$ and the plane $\vec{r}.(\vec{i} + \vec{j}) + 4 = 0$ is.....

a) 0° b) 30° c) 45° d) 90°

7) If $\vec{a}$ and $\vec{b}$ are unit vectors such that $\vec{a}\ \vec{b}\ a\times\vec{b} = \frac{1}{4}$, then the angle between $\vec{a}$ and $\vec{b}$ is ....

a) $\pi/6$ b) $\pi/4$ c) $\pi/3$ d) $\pi/2$

8) If A = $\begin{matrix} 3/5 & 4/5 \\ x & 3/5 \end{matrix}$ and $A^T = A^{-1}$ then the value of x is ....

a) $-4/5$ b) $-3/5$ c) $3/5$ d) $4/5$

9) If A = $\begin{matrix} 3 & -3 & 4 \\ 2 & -3 & -4 \\ 0 & -1 & 1 \end{matrix}$ then adj (adj A) is.....

a) $\begin{matrix} 3 & -3 & 4 \\ 2 & -3 & -4 \\ 0 & 1 & -1 \end{matrix}$ b) $\begin{matrix} 6 & -6 & 8 \\ 4 & -6 & 8 \\ 0 & -2 & 2 \end{matrix}$ c) $\begin{matrix} -3 & 3 & -4 \\ -2 & 3 & -4 \\ 0 & 1 & -1 \end{matrix}$ d) $\begin{matrix} 3 & -3 & 4 \\ 0 & -1 & 1 \\ 2 & -3 & 4 \end{matrix}$

10) If Z is a non-zero complex number, such that $2iZ^2 = \bar{Z}$ then $|Z|$ is .....

a) ½ b) 1 c) 2 d) 3

11) If $|z| = 1$ then the value of $\frac{1+z}{1+\bar{z}}$ is ......

a) z b) $\bar{z}$ c) $1/z$ d) 1

12) $i, i^2, i^3, \ldots\ldots i^{40} =$ ....

a) 1 b) i c) -1 d) $-i$

13) A zero of x^3+64 is .....

a) 0 b) 4 c) 4i d) -4

14) If α, β and γ are the zeros of x^3+px^2+qx+r then $\sum 1/\alpha$ is ....

a) $-q/r$ b) $-p/r$ c) q/r d) $-q/p$

15) $\sec^{-1} \frac{-2\sqrt{3}}{3}$ ....

a) $-5\pi/6$ b) $5\pi/6$ c) $\pi/6$ d) $-\pi/6$

16) $\sin^{-1}(2\cos^2 x-1) + \cos^{-1}(1-2\sin^2 x) =$ ......

a) $\pi/2$ b) $5\pi/6$ c) $\pi/6$ d) $-\pi/6$

17) The radius of the circle $3x^2+by^2+4bx-6by+b^2 = 0$ is

a) 1 b) 3 c) $\sqrt{10}$ d) $\sqrt{11}$

18) Area of the greatest rectangle inscribed in the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ is

a) 2ab b) ab c) $\sqrt{ab}$ d) a/b

19) If the direction cosines of a line are $\frac{1}{c}, \frac{1}{c}, \frac{1}{c}$ then

a) $c = \pm 3$ b) $c = \pm\sqrt{3}$ c) $c > 0$ d) $0 < c < 1$

20) The distance from the point (2, 5, −3) to the plane $\vec{r}.(6\vec{i} - 3\vec{j} + 2\vec{k}) = 5$ is .....

a) 1 b) 2 c) 3 d) 4

PART - B

Answer any 7 questions. Question number 30 is compulsory. **7×2=14**

21) Find the rank of the matrix $\begin{bmatrix} 4 & 3 & 1 & -2 \\ -3 & -1 & -2 & 4 \\ 6 & 7 & -1 & 2 \end{bmatrix}$

22) Solve $5x-2y+16 = 0, x+3y-7 = 0$

23) Show that the equation $z^2 = \bar{z}$ has four solutions.

24) If $|Z-2-i| = 3$ represents a equation of circle. Find the centre and radius.

25) Find a polynomial equation of minimum degree with rational co-efficents having $2i+3$ as a root.

26) Find the domain of $\cos^{-1}\left(\frac{2+\sin x}{3}\right)$

27) Find the value of $\tan^{-1}\left(\tan\frac{-\pi}{6}\right)$

28) Find the general equation of the circle whose diameter is the line segment joining the points $(-4, -2)$ and $(1, 1)$

29) Prove by vector method that an angle in a semi-circle is right angle.

30) Find the acute angle between the lines $2x = 3y = -z$ and $6x = -y = -4z$

PART - C

Answer any 7 questions. Question number 40 is compulsory. **7×3=21**

31) If $A = \begin{bmatrix} 8 & -4 \\ -5 & 3 \end{bmatrix}$ prove that $A(\text{adj } A) = (\text{adj } A)A = |A| I_2$

32) State and prove 'Triangle in equality'

33) If the equations $x^2+px+q = 0$ and $x^2+p^1x+q^1 = 0$ have a common root, show that it must be equal to $\frac{pq'-p'q}{q-q'}$ or $\frac{q-q'}{p'-p}$

34) Evaluate $\cot^{-1}(1)+\sin^{-1}\left(-\sqrt{3}/2\right) -\sec^{-1}\left(-\sqrt{2}\right)$

35) Evaluate: $\cos^{-1}\left(\cos \pi/7 \cos \pi/17 - \sin \pi/7 \sin \pi/17\right)$

36) Show that the line $x-y+4 = 0$ is a tangent to the ellipse $x^2+3y^2 = 12$. Also find its point of contact.

37) The equation $y = \frac{1}{32}x^2$ model cross sections of parabolic mirrors that are used for solar energy. There is a heating tube located at the focus of each parabola how high is this tube located above the vertex of the parabola?

38) Find the torque of the resultant of the three forces represented by $-3\vec{i}+6\vec{j}-3\vec{k}$, $4\vec{i}-10\vec{j}+12\vec{k}$ and $4\vec{i}+7\vec{j}$ acting at the point with position vector $8\vec{i}-6\vec{j}-4\vec{k}$, about the point with position vector $18\vec{i}+3\vec{j}-9\vec{k}$

39) Find the angle between the lines $x-1 = \frac{y}{2} = z+1$ and the plane $2x-y+2z = 2$ and also find the meeting point of the line and given plane.

40) Solve: $x+2y+3z = 0$; $3x+4y+4z = 0$; $7x+10y+12z = 0$

PART - D

Answer all the questions: **7×5=35**

41) If ax^2+bx+c is divided by $x+3$, $x-5$ and $x-1$, the remainders are 21, 61 and 9 respectively find a, b and c.

(OR)

Solve: $\tan^{-1}\frac{x-1}{x-2} + \tan^{-1}\frac{x+1}{x+2} = \frac{\pi}{4}$

42) If $z = x+iy$ is a complex number such that $I_m\left(\frac{2z+1}{iz+1}\right) = 0$ show that the locus of Z is $2x^2+2y^2+x-2y = 0$.

(OR)

Find the Foci, vertex and directrix of the hyperbola $9x^2-y^2-36x-6y+18 = 0$

43) Solve: (2x−3) (6x−1) (3x−2) (x−2)−5 = 0

(OR)

If $\vec{a} = 2\vec{i} + 3\vec{j} - \vec{k}$, $\vec{b} = 3\vec{i} + 5\vec{j} + 2\vec{k}$, $\vec{c} = -\vec{i} - 2\vec{j} + 3\vec{k}$, verify that

$\vec{a} \times (\vec{b} \times \vec{c}) = (\vec{a}.\vec{c})\vec{b} - (\vec{a}.\vec{b})\vec{c}$

44) Prove that $\sin^{-1}\left(\frac{3}{5}\right) - \cos^{-1}\left(\frac{12}{13}\right) = \sin^{-1}\left(\frac{16}{15}\right)$

Evaluate $\tan \cos^{-1} \frac{1}{2} - \sin^{-1} \frac{-1}{2}$

(OR)

Prove by Vector method that the perpendiculars from the vertices to the opposite sides of a triangle are concurrent.

45) A rod of length 1.2 m moves with its ends always touching the co-ordinate axes. The locus of a point P on the rod, which is 0.3 m. from the end in contact with x axis is an ellipse. Find the eccentricity.

(OR)

By using Gaussian Elimination method, Balance the chemical reaction equation. $C_2H_6 + O_2 \rightarrow H_2O + CO_2$

46) Find the vector parametric equation, vector non-parametric eqaution and Cartesian form of the equation of the plane passing through the point (0, 1, −5) and parallel to the straight lines $\vec{r} = (\vec{i} + 2\vec{j} - 4\vec{k}) + s(2\vec{i} + 3\vec{j} + 6\vec{k})$ and $\vec{r} = (\vec{i} - 3\vec{j} + 5\vec{k}) + t(\vec{i} + \vec{j} - \vec{k})$

(OR)

If 2 cos α = $x + \frac{1}{x}$, 2 cos β = $y + \frac{1}{y}$ show that (i) $\frac{x}{y} + \frac{y}{x} = 2\cos(\alpha - \beta)$

(ii) $xy - \frac{1}{xy} = 2i\sin(\alpha + \beta)$ and (iii) $x^m y^n + \frac{1}{x^m y^n} = 2\cos(m\alpha + n\beta)$

47) Solve: $6x^4 - 35x^3 + 62x^2 - 35x + 6$

(OR)

Find the equation of the circle passing through the points (1, 1) (2, −1) and (3, 2)
