T COMMON FIRST REVISION TEST - 2025

Standard - XII

Reg.No. | | | | | | |

Time: 3.00 hrs. **MATHS** *Marks: 90*

PART–A

Choose the correct answer: **20×1=20**

1) If A, B and C are invertible matrices of some order, then which one of the following is not true?
   a) adj A = $|A|A^{-1}$ b) adj(AB) = (adj A)(adj B)
   c) det A^{-1} = (det A)$^{-1}$ d) $(ABC)^{-1} = C^{-1} B^{-1} A^{-1}$

2) Which of the following is/are correct?
   (i) Adjoint of a symmetric matrix is also a symmetric matrix
   (ii) Adjoint of a diagonal matrix is also a diagonal matrix
   (iii) If A is a square matrix of order n and λ is a scalar, then adj $(\lambda A) = \lambda^n$ adj(A)
   (iv) A (adj A) = (adj A) A = $|A| I$
   a) Only (i) b) (ii) and (iii) c) (iii) and (iv) d) (i), (ii) and (iv)

3) If z is a non zero complex number, such that $2iz^2 = \bar{z}$ then $|z|$ is
   a) $\frac{1}{2}$ b) 1 c) 2 d) 3

4) If z = x + iy is a complex number such that $|z + 2| = |z - 2|$, then the locus of z is
   a) real axis b) imaginary axis
   c) ellipse d) circle

5) According to the rational root theorem, which number is not possible rational zero of $4x^7 + 2x^4 - 10x^3 - 5$?
   a) −1 b) $\frac{5}{4}$ c) $\frac{4}{5}$ d) 5

6) 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) ∞

7) If $\sin^{-1} x + \sin^{-1} y = \frac{2\pi}{3}$; then $\cos^{-1} x + \cos^{-1} y$ is equal to
   a) $\frac{2\pi}{3}$ b) $\frac{\pi}{3}$ c) $\frac{\pi}{6}$ d) π

8) If $\cot^{-1} x = \frac{2\pi}{5}$ for some $x \in R$, the value of $\tan^{-1} x$ is
   a) $\frac{-\pi}{10}$ b) $\frac{\pi}{5}$ c) $\frac{\pi}{10}$ d) $-\frac{\pi}{5}$

9) The length of the diameter of the circle which touches the x-axis at the point (1,0) and passes through the point (2,3).
   a) $\frac{6}{5}$ b) $\frac{5}{3}$ c) $\frac{10}{3}$ d) $\frac{3}{5}$

10) If $x + y = k$ is a normal to the parabola $y^2 = 12x$, then the value of k is
a) 3 b) −1 c) 1 d) 9

11) The equation of the circle passing through the foci of the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$ having centre at (0,3) is
a) $x^2 + y^2 - 6y - 7 = 0$ b) $x^2 + y^2 - 6y + 7 = 0$
c) $x^2 + y^2 - 6y - 5 = 0$ d) $x^2 + y^2 - 6y + 5 = 0$

12) If $\vec{a}, \vec{b}, \vec{c}$ are three unit vectors such that $\vec{a}$ is perpendicular to $\vec{b}$ and is parallel to $\vec{c}$ then $\vec{a} \times (\vec{b} \times \vec{c})$ is equal to
a) $\vec{a}$ b) $\vec{b}$ c) $\vec{c}$ d) $\vec{0}$

13) If the line $\frac{x-2}{3} = \frac{y-1}{-5} = \frac{z+2}{2}$ lies in the plane $x + 3y - \alpha z + \beta = 0$, then (α, β) is
a) (−5, 5) b) (−6, 7) c) (5, −5) d) (6, −7)

14) 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) $0 < c < 1$

15) The system of equations $x + 2y + 3z = 1$, $x - y + 4z = 0$, $2x + y + 7z = 1$ has _____.
a) One solution b) Two solution
c) No solution d) Infinitely many solution

16) The value of $\frac{(\cos 45° + i \sin 45°)^2 (\cos 30° - i \sin 30°)}{\cos 30° + i \sin 30°}$ is _____.
a) $\frac{1}{2} + i\frac{\sqrt{3}}{2}$ b) $\frac{1}{2} - i\frac{\sqrt{3}}{2}$ c) $-\frac{\sqrt{3}}{2} + \frac{1}{2}$ d) $\frac{\sqrt{3}}{2} + \frac{1}{2}$

17) If the roots of the equation $x^3 - x^2 - 4x + 4 = 0$ are 1, −2, 2 then the roots of $4x^3 - 4x^2 - x + 1 = 0$ are _____.
a) 1, −2, 2 b) $1, -\frac{1}{2}, \frac{1}{2}$ c) 1, 1, −2 d) −1, −2, 2

18) The principal value of $\sin^{-1}\left(\frac{-1}{2}\right)$ is _____.
a) $\frac{\pi}{6}$ b) $\frac{-\pi}{6}$ c) $\frac{\pi}{3}$ d) $\frac{-\pi}{3}$

19) The axis of the parabola $y^2 - 2y + 8x - 23 = 0$ is _____.
a) $y = -1$ b) $x = -3$ c) $x = 3$ d) $y = 1$

20) The straight lines $\frac{x-3}{2} = \frac{y+5}{4} = \frac{z-1}{-13}$ and $\frac{x+1}{3} = \frac{y-4}{5} = \frac{z+2}{2}$ are _____.
a) parallel b) perpendicular
c) inclined at 45° d) none

PART–B

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

21) If $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ is non-singular, find A^{-1}.

22) Prove that $\begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$ is orthogonal.

23) Simplify the following : $\sum_{n=1}^{10} i^{n+50}$.

24) If $z = x + iy$, find the following in rectangular form. $Re(i\bar{z})$

25) If $x^2 + 2(k+2)x + 9k = 0$ has equal roots, find k.

26) Construct a cubic equation with roots 2, $\frac{1}{2}$ and 1.

27) If $\cot^{-1}\left(\frac{1}{7}\right) = \theta$ find the value of $\cos\theta$.

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

29) Find the equation of the ellipse with foci (±2,0) and vertices (±3,0).

30) If $\vec{a}\times(\vec{b}\times\vec{c}) = (\vec{a}\times\vec{b})\times\vec{c}$ prove that $(\vec{c}\times\vec{a})\times\vec{b} = \vec{0}$.

PART–C

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

31) Verify the property $(A^T)^{-1} = (A^{-1})^T$ with $A = \begin{bmatrix} 2 & 9 \\ 1 & 7 \end{bmatrix}$.

32) Solve the following system :
$x + 2y + 3z = 0$, $3x + 4y + 4z = 0$, $7x + 10y + 12z = 0$.

33) Show that the equation $z^3 + 2\bar{z} = 0$ has five solutions.

34) Write in polar form of the following complex numbers $-1 - i$.

35) Prove that a line cannot intersect a circle at more than two points.

36) Find the domain of $\sin^{-1}(2 - 3x^2)$.

37) The equation of the ellipse is $\frac{(x-11)^2}{484} + \frac{y^2}{64} = 1$. (x and y are measured in centimeters) where to the nearest centimeter, should the patient's kidney stone be placed so that the reflected sound hits the kidney stone?

38) Prove by vector method that the area of the quadrilateral ABCD having diagonals AC and BD is $\frac{1}{2}\left|\overrightarrow{AC}\times\overrightarrow{BD}\right|$.

39) Find the distance of a point (2, 5, −3) from the plane $\vec{r}.(6\hat{i} - 3\hat{j} + 2\hat{k}) = 5$

40) Simplify : $\frac{(\cos 2\theta - i\sin 2\theta)^4(\cos 4\theta + i\sin 4\theta)^{-5}}{(\cos 3\theta + i\sin 3\theta)^{-2}(\cos 3\theta - i\sin 3\theta)^{-9}}$.

PART-D

Answer all the questions. **7×5=35**

41) a) An amount of Rs.65,000 is invested in three bonds at the rates of 6%, 8% and 9% per annum respectively. The total annual income is Rs.4,800. The income from the third bond is Rs.600 more than that from the second bond. Determine the price of each bond. (Use Gaussian elimination method)

(OR)

b) Test for consistency of the following system of linear equations and if possible solve : $4x - 2y + 6z = 8$, $x + y - 3z = -1$, $15x - 3y + 9z = 21$.

42) a) If z_1, z_2 and z_3 are three complex numbers such that $|z_1| = 1$, $|z_2| = 2$, $|z_3| = 3$ and $|z_1 + z_2 + z_3| = 1$, show that $|9z_1z_2 + 4z_1z_3 + z_2z_3| = 6$.

(OR)

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

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

(OR)

b) Solve the following equation : $x^4 - 10x^3 + 26x^2 - 10x + 1 = 0$.

44) a) Find the value of $\cot^{-1}(1) + \sin^{-1}\left(-\frac{\sqrt{3}}{2}\right) - \sec^{-1}(-\sqrt{2})$.

(OR)

b) Solve $\cot^{-1} x - \cot^{-1}(x + 2) = \frac{\pi}{12}$, $x > 0$.

45) a) Find the centre, foci and eccentricity of the hyperbola $11x^2 - 25y^2 - 44x + 50y - 256 = 0$.

(OR)

b) Using vector method, prove that $\cos(\alpha - \beta) = \cos\alpha\cos\beta + \sin\alpha\sin\beta$.

46) a) The maximum and minimum distances of the Earth from the Sun respectively are 152×10^6 km and 94.5×10^6 km. The Sun is at one focus of the elliptical orbit. Find the distance from the Sun to the other focus.

(OR)

b) Assume that water issuing from the end of a horizontal pipe, 7.5 m above the ground, describes a parabolic path. The vertex of the parabolic path is at the end of the pipe. At a position 2.5 m below the line of the pipe, the flow of water has curved outward 3 m beyond the vertical line through the end of the pipe. How far beyond this vertical line will the water strike the ground?

47) a) Find the parametric form of vector equation and cartesian equations of the plane containing the line $\vec{r} = (\hat{i} - \hat{j} + 3\hat{k}) + t(2\hat{i} - \hat{j} + 4\hat{k})$ and perpendicular to plane $\vec{r}.(\hat{i} + 2\hat{j} + \hat{k}) = 8$

(OR)

b) If $\vec{a} = \hat{i} - \hat{j}$, $\vec{b} = \hat{i} - \hat{j} - 4\hat{k}$, $\vec{c} = 3\hat{j} - \hat{k}$ and $\vec{d} = 2\hat{i} + 5\hat{j} + \hat{k}$ then verify that $(\vec{a} \times \vec{b}) \times (\vec{c} \times \vec{d}) = [\vec{a}, \vec{b}, \vec{d}]\vec{c} - [\vec{a}, \vec{b}, \vec{c}]\vec{d}$.
