PATTUKKOTTAI-PALANIAPPAN-MATHS

MATHS QUARTERLY MODEL EXAM -2022-23

CLASS 12 **PART-I** **TOTAL MARKS:90**

TIME:3Hrs

All questions are **compulsory.**

20X 1 =20

1. If $\frac{a_1}{x}+\frac{b_1}{y}=d_1,\ \frac{a_2}{x}+\frac{b_2}{y}=d_2$

$\Delta_1=\begin{vmatrix} a & b_1 \\ a_2 & b_2 \end{vmatrix},\ \Delta_2=\begin{vmatrix} a_1 & d_1 \\ a_2 & d_2 \end{vmatrix}$ and $\Delta_3=\begin{vmatrix} d_1 & b_1 \\ d_2 & b_2 \end{vmatrix}$, then x and y are respectively

(1) $\frac{\Delta_1}{\Delta_2}$ and $\frac{\Delta_1}{\Delta_3}$ (2) $\frac{\Delta_2}{\Delta_3}$ and $\frac{\Delta_1}{\Delta_2}$ (3) $\frac{\Delta_3}{\Delta_1}$ and $\frac{\Delta_2}{\Delta_1}$ (4) $\frac{\Delta_2}{\Delta_1}$ and $\frac{\Delta_3}{\Delta_1}$

2 If A is an invertible square matrix and k is a non negative real number, then $(kA)^{-1}=$

(1) kA^{-1} (2) $\frac{1}{k}k^{\ 1}$ (3) $-kA^{-1}$ (4) $-\frac{1}{k}A^{-1}$

3. If $A\ \begin{bmatrix} 2 & 0 \\ 1 & 5 \end{bmatrix}$ and $B\ \begin{bmatrix} 1 & 4 \\ 2 & 0 \end{bmatrix}$ then $|\operatorname{adj}(AB)|=$

(1) -80 (2) -60 (3) -20 (4) -40

4. If $P\ \begin{bmatrix} 1 & x & 0 \\ 1 & 3 & 0 \\ 2 & 4 & 2 \end{bmatrix}$ is the adjoint of 3×3 matrix A and $|A|=4$, then x is

(1) 12 (2) 15 (3) 11 (4) 14

5. The modulus and principal argument of the complex number $z=-2(\cos\theta-i\sin\theta)$ $\left(\text{where } 0<\theta\le\frac{\pi}{2}\right)$ are, respectively,

(1) $2,-\theta$ (2) $2,\pi-\theta$ (3) $-2,\theta$ (4) $2,-\pi+\theta$

6. If $x+iy=\left(-1+i\sqrt{3}\right)^{2019}$, then x is

(1) 2^{2019} (2) -2^{2019} (3) -1 (4) 1

7. If z is a non zero complex number, such that $2iz^2\ \ \bar{z}$ then $|z|$ is

(1) 2 (2) 3 (3) $\frac{1}{2}$ (4) 1

8. If $\left|z\ \ \frac{3}{z}\right|\ \ 2$, then the least value of $|z|$ is

(1) 3 (2) 5 (3) 2 (4) 1

9. The polynomial x^3+2x+3 has

(1) no zeros (2) one positive and two imaginary zeros

(3) three real zeros (4) one negative and two imaginary zeros

10. $2x^3-x^2-2x+2=Q(x)(2x-1)+R(x)$ for all values of x. The value of $R(x)$ is

(1) 1 (2) 0 (3) $\frac{1}{2}$ (4) $-\frac{1}{2}$

11. $\sin^{\ 1}\frac{3}{5}\ \ \cos^{\ 1}\frac{12}{13}+\sec^{\ 1}\frac{5}{3}\ \ \operatorname{cosec}^{\ 1}\frac{13}{12}$ is equal to

(1) 2π (2) π (3) 0 (4) $\tan^{-1}\frac{12}{65}$

12. If $\sin^{\ 1} x \quad 2\sin^{\ 1}\alpha$ has a solution, then

(1) $|\alpha| \le \frac{1}{\sqrt{2}}$ (2) $|\alpha| \ge \frac{1}{\sqrt{2}}$ (3) $|\alpha| < \frac{1}{\sqrt{2}}$ (4) $|\alpha| > \frac{1}{\sqrt{2}}$

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

(1) $4(a^2+b^2)$ (2) $2(a^2+b^2)$ (3) a^2+b^2 (4) $\frac{1}{2}(a^2+b^2)$

14. If the two tangents drawn from a point P to the parabola $y^2 = 4x$ are at right angles then the locus of P is

(1) $2x+1 \quad 0$ (2) $x \quad 1$ (3) $2x \quad 1 \quad 0$ (4) $x=1$

15. The values of m for which the line $y \quad mx+2\sqrt{5}$ touches the hyperbola $16x^2 \quad 9y^2 \quad 144$ are the roots of $x^2 \quad (a+b)x \quad 4 \quad 0$, then the value of $(a+b)$ is

(1) 2 (2) 4 (3) 0 (4) -2

16. The radius of the circle $3x^2+by^2+4bx \quad 6by+b^2 \quad 0$ is

(1) 1 (2) 3 (3) $\sqrt{10}$ (4) $\sqrt{11}$

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

(1) $\frac{\pi}{6}$ (2) $\frac{\pi}{4}$ (3) $\frac{\pi}{3}$ (4) $\frac{\pi}{2}$

18. Distance from the origin to the plane $3x-6y+2z+7=0$ is

(1) 0 (2) 1 (3) 2 (4) 3

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

(1) $c=\pm 3$ (2) $c=\pm\sqrt{3}$ (3) $c>0$ (4) $0<c<1$

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

(1) $\vec{a}$ (2) $\vec{b}$ (3) $\vec{c}$ (4) $\vec{0}$

PART-II

Note: (i) Answer any SEVEN questions **7×2 =14**

(ii) Question number 30 is compulsory

21. Find the matrix A for which $A\begin{bmatrix} 5 & 3 \\ 1 & 2 \end{bmatrix} \quad \begin{bmatrix} 14 & 7 \\ 7 & 7 \end{bmatrix}$.

22. Simplify $i i^2 i^3 \cdots i^{2000}$

23. If $\omega \neq 1$ is a cube root of unity, show that $(1 \quad \omega+\omega^2)^6+(1+\omega \quad \omega^2)^6 \quad 128.$

24. Form a polynomial equation with integer coefficients with $\sqrt{\frac{\sqrt{2}}{\sqrt{3}}}$ as a root.

25. Is $\cos^{1}(\ \ x)\quad \pi \quad \cos^{1}(x)$ true? Justify your answer.

26 Find the centre and radius of the circle $3x^2 + \ \ a+1\ \ y^2 + 6x \quad 9y + a + 4 \quad 0$.

27. Find the equation of the parabola with vertex $(-1,-2)$, axis parallel to y-axis and passing through $(3,6$.

28. If the vectors $a\hat{i} + a\hat{j} + c\hat{k}$, $\hat{i} + \hat{k}$ and $c\hat{i} + c\hat{j} + b\hat{k}$ are coplanar, prove that c is the geometric mean of a and b

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

30. If A is a non-singular square matrix of order n, then $|\text{adj}(\text{adj}A)| = |A|^{(n-1)^2}$

PART-III

Note: (i) Answer any SEVEN questions **7×3 =21**

(ii) Question number 40 is compulsory

31. Find the inverse of the non-singular matrix $A \quad \begin{bmatrix} 0 & 5 \\ \ \ 1 & 6 \end{bmatrix}$, by Gauss-Jordan method.

32 In a competitive examination, one mark is awarded for every correct answer while $\frac{1}{4}$ mark is deducted for every wrong answer. A student answered 100 questions and got 80 marks. How many questions did he answer correctly ? (Use Cramer's rule to solve the problem).

33. Find the least value of he positive integer n for which $\left(\sqrt{3}+i\right)^n$

(i) real (ii) purely imaginary.

34. If p is real, discuss the nature of the roots of the equation $4x^2 + 4px + p + 2 \quad 0$, in terms of p .

35. Find the value of $\cos\left[\frac{1}{2}\cos^{1}\left(\frac{1}{8}\right)\right]$

36. Prove that the length of the latus rectum of the hyperbola $\frac{x^2}{a^2} \quad \frac{y^2}{b^2} \quad 1$ is $\frac{2b^2}{a}$.

37. If the normal at the point 't_1' on the parabola $y^2 = 4ax$ meets the parabola again at the point 't_2', then prove that $t_2 \qquad \left(t_1 + \frac{2}{t}\right)_1$.

38. If $\vec{a} = \hat{i} + 2\hat{j} + 3\hat{k}$, $\vec{b} = 2\hat{i} - \hat{j} + \hat{k}$, $\vec{c} = 3\hat{i} + 2\hat{j} + \hat{k}$ and $\vec{a} \times (\vec{b} \times \vec{c}) = l\vec{a} + m\vec{b} + n\vec{c}$, find the values of l, m, n .

39. If a plane meets the coordinate axes at $A, B\ \ C$ such that the centriod of the triangle ABC is the point (u, v, w), find the equation of the plane.

40. Find the principal argument Arg z, when $z \quad \frac{2}{1 + i\sqrt{3}}$.

PART-IV

Note: Answer all the questions **7×5 =35**

41a) If ax^2+bx+c is divided by $x+3, x\quad 5$, and $x-1$, the remainders are $21, 61$ and 9 respectively. Find a, b and c. (Use Gaussian elimination method.)

(OR)

b) Find the value of k for which the equations $kx\quad 2y+z\quad 1,\ x\quad 2ky+z\quad 2,\ x\quad 2y+kz\quad 1$ have

(i) no solution (ii) unique solution (iii) infinitely many solution

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

b) If $\frac{1+z}{1\quad z}\quad \cos 2\theta + i\sin 2\theta$, show that $z\quad i\tan\theta$.

43 a) Find all zeros of the polynomial $x^6\quad 3x^5\quad 5x^4+22x^3\quad 39x^2\quad 39x+135$, if it is known that $1+2i$ and $\sqrt{3}$ are two of its zeros.

(OR)

b) Solve the equation $6x^4\quad 5x^3\quad 38x^2\quad 5x+6\quad 0$ if it is known that $\frac{1}{3}$ is a solution.

44 a) Find the value of $\cos^{\ 1}\left(\cos\left(\frac{4\pi}{3}\right)\right)+\cos^{\ 1}\left(\cos\left(\frac{5\pi}{4}\right)\right)$.

(OR)

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

45 a) Find the equation of the circle passing through the points $(1,1)$, $(2,-1)$, and $(3,2)$.

(OR)

b) Find the vertex, focus, equation of directrix and l ngth of the latus rectum of $y^2\quad 4y\quad 8x+12\quad 0$

46a) Prove by vector method that the perpendiculars (attitudes) from the vertices to the opposite sides of a triangle are concurrent.

(OR)

b) Find parametric form of vector equation and Cartesian equations of the plane passing through the points $(2,2,1), (1,-2,3)$ and parallel to the straight line passing through the points $(2,1,-3)$ and $(-1,5,-8)$.

47 a) A tunnel through a mountain for a four lane highway is to have a elliptical opening. The total width of the highway (not the opening) is to be $16m$, and the height at the edge of the road must be sufficient for a truck $4m$ high to clear if the highest point of the opening is to be $5m$ approximately How wide must the opening be?

(OR)

b) Prove by vector method that $\sin(\alpha-\beta)=\sin\alpha\cos\beta-\cos\alpha\sin\beta$.