DINESH TUITION CENTER,
(Opposite Aanandh Jewellery)
19, Paalayam Bazzar, Woraiyur, Trichy

12th Standard Mathematics

Quarterly Model Question Paper

2022-2023

Classes in Youtube: Dinesh Centum Maths

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Dinesh Tuition Center.
19, Paalayam Bazzar, Kulaiyur, Trichy.
Youtube Dinesh Centum maths, Website dineshcentummaths.blogspot.com
Ph.No: 7418865975

Quarterly Common Exam - Model Question Paper - 2022-23.

12th Standard

Part - I

$20 \times 1 = 20$

Answer all the questions

1. If $A = \begin{bmatrix} 3 & 5 \\ 1 & 2 \end{bmatrix}$, $B = adj\ A$ and $C = 3A$, then $\frac{|adj\ B|}{|C|} =$

(1) $\frac{1}{3}$ (2) $\frac{1}{9}$ (3) $\frac{1}{4}$ (4) 1.

2. If $A = \begin{bmatrix} 7 & 3 \\ 4 & 2 \end{bmatrix}$, then $9I_2 - A =$

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

3. If $A = \begin{bmatrix} 2 & 3 \\ 5 & -2 \end{bmatrix}$ be such that $\lambda A^{-1} = A$, then λ is

(1) 17 (2) 14 (3) 19 (4) 21.

4. If $x^a y^b = e^m$, $x^c y^d = e^n$, $\Delta_1 = \begin{vmatrix} m & b \\ n & d \end{vmatrix}$, $\Delta_2 = \begin{vmatrix} a & m \\ c & n \end{vmatrix}$, $\Delta_3 = \begin{vmatrix} a & b \\ c & d \end{vmatrix}$, then the values of x and y are respectively.

(1) $e^{(\Delta_2/\Delta_1)}, e^{(\Delta_3/\Delta_1)}$ (2) $\log(\Delta_1/\Delta_3), \log(\Delta_2/\Delta_3)$

(3) $\log(\Delta_2/\Delta_1), \log(\Delta_3/\Delta_1)$ (4) $e^{(\Delta_1/\Delta_3)}, e^{(\Delta_2/\Delta_3)}$

5. $i^n + i^{n+1} + i^{n+2} + i^{n+3}$ is

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

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

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

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7. The Value of $\left(\frac{1+\sqrt{3}i}{1-\sqrt{3}i}\right)^{10}$ is

(1). $cis\ \frac{2\pi}{3}$ (2). $cis\ \frac{4\pi}{3}$ (3). $-cis\ \frac{2\pi}{3}$ (4). $-cis\ \frac{4\pi}{3}$

8. If α, β and γ are the zeros of x^3+px^2+qx+r, then $\sum \frac{1}{\alpha}$ is

(1). $-\frac{q}{r}$ (2) $-\frac{p}{r}$ (3). $\frac{q}{r}$ (4).

9. If $x^3 + 12x^2 + 10ax + 1999$ definitely has a Positive zero, if and only if.

(1). $a \geq 0$ (2). $a > 0$ (3). $a < 0$ (4). $a \leq 0$.

10. The number of Positive zeros of the Polynomial $\sum_{j=0}^{n} {}^nC_r(-1)^r x^r$ is

(1) 0 (2). n (3). $< n$ (4). r.

11. If $\sin^{-1}x + \sin^{-1}y = \frac{2\pi}{3}$; then $\cos^{-1}x + \cos^{-1}y$ is equal to

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

12. The Value of $\sin^{-1}(\cos x)$, $0 \leq x \leq \pi$ is

(1). $\pi - x$ (2). $x - \frac{\pi}{2}$ (3). $\frac{\pi}{2} - x$ (4). $x - \pi$

13. If $\cot^{-1}x = \frac{2\pi}{5}$ for some $x \in R$, the Value of $\tan^{-1}x$ is

(1). $-\frac{\pi}{10}$ (2). $\frac{\pi}{5}$ (3) $\frac{\pi}{10}$ (4). $-\frac{\pi}{5}$

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14. If $\cot^{-1}2$ and $\cot^{-1}3$ are two angles of a triangle, then the third angle is

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

15. The eccentricity of the hyperbola whose latus rectum is 8 and conjugate axis is equal to half the distance between the foci is

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

16. The radius of the circle passing through the point (6,2) two of whose diameter are $x+y=6$ and $x+2y=4$ is

(1) 10 (2) $2\sqrt{5}$ (3) 6 (4) 4.

17. The eccentricity of the ellipse $(x-3)^2+(y-4)^2=\frac{y^2}{9}$ is

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

18. If a vector $\vec{\alpha}$ lies in the plane of $\vec{\beta}$ and $\vec{\gamma}$, then

(1) $[\vec{\alpha},\vec{\beta},\vec{\gamma}]=1$ (2) $[\vec{\alpha},\vec{\beta},\vec{\gamma}]=-1$ (3) $[\vec{\alpha},\vec{\beta},\vec{\gamma}]=0$ (4) $[\vec{\alpha},\vec{\beta},\vec{\gamma}]=2$.

19. If $\vec{a},\vec{b},\vec{c}$ are non-coplanar, non-zero vectors such that $[\vec{a},\vec{b},\vec{c}]=3$, then $\{[\vec{a}\times\vec{b},\vec{b}\times\vec{c},\vec{c}\times\vec{a}]\}^2$ is equal to

(1) 81 (2) 9 (3) 27 (4) 18.

20. 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) $0<c<1$

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Part - II

Answer any SEVEN Questions. $7 \times 2 = 14$

Q.No. 30 is compulsory

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

22. Simplify the following.

$$i^{59} + \frac{1}{i^{59}}.$$

23. Find z^{-1}, if $z = (2+3i)(1-i)$

24. Show that, if p, q, r are rational, the roots of the equation $x^2 - 2px + p^2 - q^2 + 2qr - r^2 = 0$ are rational.

25. For What Value of x does $\sin x = \sin^{-1} x$?

26. Find the general equation of a circle with centre $(-3, -4)$ and radius 3 units.

27. Identify the type of conic section for the equation.

$$3x^2 + 2y^2 = 14.$$

28. If $\vec{a}, \vec{b}, \vec{c}$ are three Vectors. Prove that $[\vec{a}+\vec{c}, \vec{a}+\vec{b}, \vec{a}+\vec{b}+\vec{c}] = [\vec{a}, \vec{b}, \vec{c}]$

29. If $\vec{a} = \hat{i} - 2\hat{j} + 3\hat{k}$, $\vec{b} = 2\hat{i} + \hat{j} - 2\hat{k}$, $\vec{c} = 3\hat{i} + 2\hat{j} + \hat{k}$. find $\vec{a} \times (\vec{b} \times \vec{c})$

30. State Rouche - Capelli Theorem.

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19, Poolayam Bazzar, Uraiyur, Trichy.
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Part - III

Answer any SEVEN Questions. $7 \times 3 = 21$

Q.No. 40 is compulsory.

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

32. Find the inverse (if it exists) of the following

$$\begin{bmatrix} 2 & 3 & 1 \\ 3 & 4 & 1 \\ 3 & 7 & 2 \end{bmatrix}$$

33. Find the value of the real numbers x and y, if the complex number $(2+i)x + (1-i)y + 2i - 3$ and $x + (-1+2i)y + 1 + i$ are equal.

34. If $z_1 = 2 - i$ and $z_2 = -4 + 3i$, find the inverse of $z_1 z_2$ and $\frac{z_1}{z_2}$

35. Solve the equation $3x^3 - 16x^2 + 23x - 6 = 0$ if the product of two roots is 1.

36. Find the Principal value of $\cos^{-1}\left[\frac{\sqrt{3}}{2}\right]$

37. Find the equation of the Parabola with focus $(-\sqrt{2}, 0)$ and directrix $x = \sqrt{2}$.

38. Find the equation of the ellipse foci $(\pm 3, 0)$, $e = \frac{1}{2}$.

39. Show that the lines $\frac{x-1}{4} = \frac{2-y}{6} = \frac{z-4}{12}$ and $\frac{x-3}{-2} = \frac{y-3}{3} = \frac{5-z}{6}$ are Parallel.

40. Write 1) Jacobi's identity
2) Lagrange's identity.

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Part - IV

$7 \times 5 = 35$.

41 (a). Find the value of k for which the equations $kx - 2y + z = 1$, $x - 2ky + z = -2$, $x - 2y + kz = 1$ have.

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

OR

(b). Determine the value of λ for which the following system of equations. $(3\lambda - 8)x + 3y + 3z = 0$, $3x + (3\lambda - 8)y + 3z = 0$, $3x + 3y + (3\lambda - 8)z = 0$

42. (a). Find the value of $\sum_{k=1}^{8} \cos\left(\frac{2k\pi}{9} + i\sin\frac{2k\pi}{9}\right)$

OR.

(b). If $z = x + iy$ and $\arg\left[\frac{z-1}{z+1}\right] = \frac{\pi}{2}$, Show that $x^2 + y^2 = 1$.

43. a). Solve the equation $x^4 - 9x^2 + 20 = 0$.

OR.

b). Find the exact number of real zeros and Imaginary of the Polynomial $x^9 + 9x^7 + 7x^5 + 5x^3 + 3x$.

44. a). Prove that $\tan(\sin^{-1}x) = \frac{x}{\sqrt{1-x^2}}$, $-1 < x < 1$.

OR

b). Find the number of solutions of the equation

$\tan^{-1}(x-1) + \tan^{-1}x + \tan^{-1}(x+1) = \tan^{-1}(3x)$.

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45. a). Find the equations of tangent and normal to the parabola $x^2 + 6x + 4y + 5 = 0$ at $(1, -3)$.

OR

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

46. a). Find the Vector equation in Parametric form and Cartesian equations of a straight Passing through the Points $(-5, 7, -4)$ and $(13, -5, 2)$. Find the point where the straight line cross the xy-plane

OR.

b). If the straight line $\frac{x-5}{5m+2} = \frac{2-y}{5} = \frac{1-z}{-1}$ and $x = \frac{2y+1}{4m} = \frac{1-z}{-3}$ are perpendicular to each other, find the value of m.

47. a). By using Gaussian elimination method, balance the chemical reaction equation : $C_2H_6 + O_2 \longrightarrow H_2O + CO_2$.

OR

b). Determine whether the pair of straight lines $\vec{r} = 2\hat{i} + 6\hat{j} + 3\hat{k}) + t(3\hat{i} + 3\hat{j} + 4\hat{k})$ $\vec{r} = 2\hat{j} - 3\hat{k}) + s(\hat{i} + 2\hat{j} + 3\hat{k})$ are parallel. Find the shortest distance between them