V12M

Virudhunagar District

Common Second Revision Examination - 2025

Standard 12

MATHEMATICS

Time: 3.00 Hours | Marks: 90

Part - I

Answer all the questions **20×1=20**

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

a) A^{-1} b) $\frac{A^{-1}}{2}$ c) $3A^{-1}$ d) $2A^{-1}$

2) In the system of equations with 3 unknows, if $\Delta=0$, and one of $\Delta x, \Delta y, \Delta z$ is non zero then the system is

a) consistent

b) in consistent

c) consistent with one parameter family of solutions

d) consistent with two parameter family of solutions

3) The conjugate of a complex number is $\frac{1}{i-2}$ then the complex number is

a) $\frac{1}{i+2}$ b) $-\frac{1}{i+2}$ c) $\frac{-1}{i-2}$ d) $\frac{1}{i-2}$

4) If $x^2+y^2=1$, then the value of $\frac{1+x+iy}{1+x-iy}$ is

a) x−iy b) 2x c) −2iy d) x+iy

5) If α, β, γ are the roots of the equation $x^3-3x+11=0$, then $\alpha+\beta+\gamma$ is

a) 0 b) 3 c) −11 d) −3

6) If $\sin^{-1}x+\cot^{-1}\left(\frac{1}{2}\right)=\frac{\pi}{2}$, then x is equal to

a) $\frac{1}{2}$ b) $\frac{1}{\sqrt{5}}$ c) $\frac{2}{\sqrt{5}}$ d) $\frac{\sqrt{3}}{2}$

7) 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) $x^2+y^2-6y+5=0$

8) y=mx+c is a tangent to the parabola $y^2=4ax$, then

a) $c=\frac{a}{m}$ b) $c=\frac{m}{a}$ c) $c^2=a^2m^2+b^2$ d) m=c

9) 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) $0<c<1$

10) 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

11) The tangent to the curve $y^2-xy+9=0$ is vertical when

a) y=0 b) $y=\pm\sqrt{3}$ c) $y=\frac{1}{2}$ d) $y=\pm 3$

12) The point of inflection of the curve $y=(x-1)^3$ is

a) (0, 0) b) (0, 1) c) (1, 0) d) (1, 1)

13) Linear approximation for g(x) = cos x at $x = \frac{\pi}{2}$ is

a) $x + \frac{\pi}{2}$ b) $-x + \frac{\pi}{2}$ c) $x - \frac{\pi}{2}$ d) $-x - \frac{\pi}{2}$

14) The value of $\int_{-1}^{2} |x|\,dx$ is

a) $\frac{1}{2}$ b) $\frac{3}{2}$ c) $\frac{5}{2}$ d) $\frac{7}{2}$

15) The volume of solid of revolution of the region bounded by $y^2=x(a-x)$ about x-axis is

a) πa^3 b) $\frac{\pi a^3}{4}$ c) $\frac{\pi a^3}{5}$ d) $\frac{\pi a^3}{6}$

16) The solution of the differential equation $\frac{dy}{dx} + \frac{1}{\sqrt{1-x^2}} = 0$ is

a) $y+\sin^{-1}x = C$ b) $x+\sin^{-1}y=0$ c) $y^2+2\sin^{-1}x=C$ d) $x^2+2\sin^{-1}y=0$

17) The order of the differential equation of all circles with centre at (h, k) and radius a is

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

18) If $f(x) = \begin{cases} 2x, & 0 \le x \le a \\ 0, & \text{otherwise} \end{cases}$ is a probability density function of a random variable, then the value of a is

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

19) var(2x+5) is equal to

a) 5 b) var(2x)+5 c) 4var(x) d) 0

20) The operation * defined by $a*b = \frac{ab}{7}$ is not a binary operation on

a) Q^+ b) Z c) R d) C

Part - II

Answer any 7 questions. Q.No. 30 is compulsory **7×2=14**

21) If adj $A = \begin{bmatrix} 0 & -2 & 0 \\ 6 & 2 & -6 \\ -3 & 0 & 6 \end{bmatrix}$ find A^{-1}

22) Simplify $\sum_{n=1}^{102} i^n$

23) Find the value of $\tan^{-1}\left(\tan\frac{5\pi}{4}\right)$

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

25) Find the intercepts cutoff by the plane $\vec{r}.(6\hat{i}+4\hat{j}+3\hat{k}) = 12$ on the coordinate axes

26) A particle is fired straight up from the ground to reach a height of x feet in t seconds, where $s=128t-16t^2$, compute the maximum height of the particle reached?

27) Evaluate: $\int_0^{\infty} x^5 e^{-3x}\,dx$

28) Solve: $\frac{dy}{dx} + 2y = e^{-x}$

29) If x is the random variable with distribution function F(x) given by

$$F(x) = \begin{cases} 0 & x < 0 \\ \frac{1}{2}(x^2 + x) & 0 \le x < 1 \\ 1 & x \ge 1 \end{cases}$$

then find the probability density function f(x).

30) $A = \begin{bmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \\ 1 & 0 & 0 & 1 \end{bmatrix}$, $B = \begin{bmatrix} 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \\ 1 & 0 & 0 & 1 \end{bmatrix}$ then find $A \wedge B$

Part - III

Answer any 7 questions. Q.No. 40 is compulsory **7×3=21**

31) Solve the system of linear equations by matrix inversion method
2x-y=8, 3x+2y=-2

32) Solve: $\sin^2 x - 5\sin x + 4 = 0$

33) A concrete bridge is designed as a parabolic arch. The road over bridge is 40m long and the maximum height of the arch is 15m. Write an equation of the parabolic arch

34) A particle acted on by constant forces $8\hat{i} + 2\hat{j} - 6\hat{k}$ and $6\hat{i} + 2\hat{j} - 2\hat{k}$ is displaced from the point (1, 2, 3) to the point (5, 4, 1). Find the total work done by the forces

35) Prove that the function $f(x) = x^2 + 2$ is strictly increasing in the internal (2, 7) and strictly decreasing in the interval (-2, 0).

36) Show that $f(x, y) = \frac{x^2 - y^2}{y^2 + 1}$ is continuous at every $(x, y) \in R^2$

37) Evaluate : $\int_2^3 \frac{\sqrt{x}}{\sqrt{5-x} + \sqrt{x}} dx$

38) Solve: $\frac{dy}{dx} = (3x + y + 4)^2$

39) Prove that $q \to p \equiv \neg P \to \neg q$

40) If $\sin\left(\sin^{-1}\left(\frac{1}{5}\right) + \cos^{-1} x\right) = 1$, then find the value of x

Part - IV

Answer all the questions. **7×5=35**

41) a) Solve the following systems of linear equations by Cramer's rule:
3x+3y-z=11, 2x-y+2z=9, 4x+3y+2z=25

(OR)

b) Solve : $(x^2 - 3y^2)dx + 2xy\,dy = 0$

42) a) Suppose Z_1, Z_2 and Z_3 are the vertices of an equilateral triangle inscribed in the circle $|Z|=2$ ... If $Z_1 = 1 + i\sqrt{3}$ then find Z_2 and Z_3

(OR)

b) Find the area of the region bounded by the parabola $y^2=x$ and the line $y=x-2$

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

(OR)

b) The probability density function of x is given by $f(x) = \begin{cases} k, & 1 \le x \le 5 \\ 0 & \text{otherwise} \end{cases}$

find i) distribution function (ii) $P(x<3)$ (iii) $P(2 < x < 4)$ (iv) $P(3 \le X)$

44) a) Solve: $\cos\left(\sin^{-1}\left(\frac{x}{\sqrt{1+x^2}}\right)\right) = \sin\left(\cot^{-1}\left(\frac{3}{4}\right)\right)$

(OR)

b) For the function $f(x) = 4x^3 + 3x^2 - 6x + 1$ find the intervals of monotonicity, local extrema, intervals of concavity and points of inflection.

45) a) For the ellipse, $4x^2+y^2+24x-2y+21=0$, find the centre, vertices and the foci. Also prove that the length of latus rectum is 2

(OR)

b) If $w(x, y, z) = x^2 + y^2 + z^2$, $x=e^t$, $y=e^t \sin t$ and $z = e^t \cos t$, find $\frac{dw}{dt}$.

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

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

(OR)

b) Find the angle of intersection of the curves $2y^2 = x^3$ and $y^2=32x$

47) a) Find the volume of a right circular cone of base radius r and height h.

(OR)

b) Using the truth table, prove that $p \leftrightarrow q = (P \rightarrow q) \wedge (q - p)$

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