2 4 5 6 8 11 12 14 16 18 19

12th Std	I Revision Exam - 2019-20	Reg. No.
Time : 3.00 hrs	MATHEMATICS	Marks : 90

Part - I

I. Choose the correct Answer : **20x1=20**

1. If $(A^T)(A^{-1})$ is symmetric then A2 =
   a) A^{-1} b) $(A^T)^2$ c) A^T d) $(A^{-1})^2$

2. If $|adj(A)| = 4$ of order 2, then $|adj(3A)|$
   a) 12 b) 48 c) 36 d) 24

3. If $|Z| - Z = 1+2i$, then the solution is
   a) $\frac{3}{2} - 2i$ b) $-\frac{3}{2} + 2i$ c) $2 - \frac{3}{2}i$ d) $2 + \frac{3}{2}i$

4. The principal solution of the equation $Z = \frac{2}{1+i\sqrt{3}}$ is
   a) $\frac{2\pi}{3}$ b) $\frac{-2\pi}{3}$ c) $\frac{\pi}{2}$ d) 0

5. The number of real numbers in $[0, 2\pi]$ satisfying $\sin^{-1}x - 2\sin^2 x + 1 = 0$ is
   a) 2 b) 4 c) 1 d) ∞

6. If the roots of the equation $x^2 + 2(k+2)x + 9k = 0$ are equal, then the value of k is
   a) 4 b) 1 c) 4, 1 d) 0

7. If $\cot^{-1}(\sqrt{\sin\alpha}) + \tan^{-1}(\sqrt{\sin\alpha}) = u$, then the value of $\cos 2u$ is
   a) $\tan^2\alpha$ b) 0 c) -1 d) $\tan 2\alpha$

8. If $\theta = \tan^{-1}(7)$, then $\sec\theta$ is
   a) $\frac{1}{5\sqrt{2}}$ b) $5\sqrt{2}$ c) $\frac{1}{25\sqrt{2}}$ d) $25\sqrt{2}$

9. If the co-ordinates at one end of a diameter of the circle $x^2 + y^2 - 8x - 4y + c = 0$ are (2, -5) the co-ordinates of the other end are
   a) (2, 11) b) (11, 2) c) (5, 2) d) (-5, 2)

10. If $\vec{a} = \vec{i} + \vec{j} + \vec{k}$, $\vec{b} = \vec{i} + \vec{j}$, $\vec{c} = \vec{i}$ and $(\vec{a}\times\vec{b})\times\vec{c} = \lambda a + \mu b$, then the value of $\lambda+\mu$ is
    a) 0 b) 1 c) 6 d) 3

11. The angle between the planes $\vec{r}.(2\vec{i} + 2\vec{j} + 2\vec{k}) = 4$ and $4x - 2y + 2z = 15$ is
    a) $\cos^{-1}\left(\frac{\sqrt{3}}{2}\right)$ b) $\cos^{-1}\left(\frac{\sqrt{2}}{3}\right)$ c) $\sin^{-1}\left(\frac{\sqrt{3}}{2}\right)$ d) $\tan^{-1}\left(\frac{\sqrt{3}}{2}\right)$

12. If $f(x) = 2\cos 4x$ then the slope of the normal at $x = \frac{\pi}{12}$ is
    a) $-4\sqrt{3}$ b) -4 c) $\frac{\sqrt{3}}{12}$ d) $4\sqrt{3}$

13. The local maximum value of $f(x) = x^4 + 32x$.
    a) 24 b) -24 c) 48 d) -48

14. If $U = x^3 + y^3 + 6 \sin z + 11$ then $u_z(1, 0, \pi)$ is

a) 3 b) - 3 c) 6 d) -6

15. $\int_0^1 x(1-x)^{99} =$

a) $\frac{1}{11000}$ b) $\frac{1}{10100}$ c) $\frac{1}{10010}$ d) $\frac{1}{10001}$

16. The value of $\int_0^{\pi} \sin 2x \, dx + 2 \int_0^{\pi/2} \cos 2x \, dx$

a) π b) $-\pi$ c) 0 d) 2

17. If $\frac{dy}{dx} + y = \frac{1+y}{x}$, then the integrating factor (I, F) is

a) $\frac{x}{e^x}$ b) $\frac{e^x}{x}$ c) λe^x d) e^x

18. The differential equation of $x^2 + y^2 = 25$ is

a) $y' = -\frac{x}{y}$ b) $y' = \frac{x}{y}$ c) $y' = \frac{y}{x}$ d) $y' = -\frac{y}{x}$

19. In a binomial distribution with mean 4 and the probability of success is 1/3, then the number of trials is

a) 12 b) 16 c) 10 d) 14.

20. In the set define $a \bullet b = a+b+ab$, for what value of y, $3 \bullet (y \bullet 5) = 7$?

a) $y = \frac{2}{3}$ b) $y = -\frac{2}{3}$ c) $y = -\frac{3}{2}$ d) $y = 4$

Part - II

II. Answer any 7 Questions only and 25th Question is compulsory. 7x2=14

21. Prove that $\begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$ is orthogonal. $AA^T = I$

22. Simplify :- $i^{59} + \frac{1}{i^{59}}$.

23. What is the director circle of ellipse $9x^2 + 4y^2 = 36$.

24. Find the volume of the parallelopiped whose coterminous edges are represented by the vectors $-6\hat{i} + 14\hat{j} + 10\hat{k}$, $14\hat{i} - 10\hat{j} - 6\hat{k}$ and $2\hat{i} + 4\hat{j} - 2\hat{k}$.

25. If the volume of a cube of side length x is $v = x^3$. find the rate of change of the volume with respect to x when x = 5 units.

26. Let us assume that the shape of a soap bubble is a sphere. Use linear approximation to approximate the increase in the surface area of a soap bubble as its radius increases from 5 cm to 5.2 cm. Also calculate the percentage error. 1.9607%

27. Evaluate $\int_0^{\pi/2} e^{-x} \sin x \, dx$.

a)

28. Find the value of m so that the function $y = e^{mx}$ is a solution of the given differential equation $y' + 2y = 0$.

29. Let $A = \begin{pmatrix} 0 & 1 \\ 1 & 1 \end{pmatrix}$, $B = \begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix}$ be any two boolean matrices of the same type. Find $A \vee B$ and $A \wedge B$.

30. Obtain the condition that the roots of $x^3 + px^2+qx+r=0$ are in A.P.

part - III

Answer any 7 questions. Question No.40 is compulsory. **7x3=21**

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

32. Find the real values of x and y if $(x+iy)(2-3i) = 6+4i$.

33. Find the value of $\sec^{-1}\left(\frac{-2\sqrt{3}}{3}\right)$.

34. Find the equation of the tangent to the parabola $y^2 = 16x$ perpendicular to $2x + 2y + 3 = 0$.

35. Find the vector equation in parametric form and cartesian equations of the line passing through (-4, 2, -3) and is parallel to the line $\frac{-x-2}{4} = \frac{y+3}{-2} = \frac{2z-6}{3}$.

36. Verify Rolle's theorem for $f(x) = e^x \sin x$, $0 \le x \le \pi$.

37. Find g_{xy}, g_{xx}, g_{yy} for the function $g(x, y) = x^2 + 3xy - 7y + \cos(5x)$. 3, 2 -25cos5x, 0, 3

38. A pair of fair dice is rolled. Find the probability mass function to get the number of fours.

39. Show that $p \to q$ and $q \to p$ are not equivalent.

40. Solve : $\frac{dy}{dx} + 2y \cot x = 3x^2 . \operatorname{cosec}^2 x$.

Part - IV

Answer all the questions. **7x5=35**

41. a) Investigate for what values of λ and μ the system of linear equations. $\lambda=7$ $\mu\neq 9$ $\lambda\neq 7$ μ is an real number
$\lambda + 2y + z = 7$, $x + y + \lambda z = \mu$, $x + 3y - 5z = 5$ has (i) no solution (ii) a unique solution (iii) an infinite number of solutions.

$$\left[\begin{array}{ccc|c} 1 & 2 & 1 & 7 \\ 0 & 1 & -6 & -2 \\ 0 & 0 & -7 & \mu-9 \end{array}\right]$$

$\lambda=7$ $\mu=9$

(OR)

b) Two coast guard stations are located 600 km apart at points A(0, 0) and B (0, 600). A distress signal from a ship at P is received at slightly different times by two stations. It is determined that the ship is 200 km further from station A than it is from station B. Determine the equation of hyperbola passes through the location of the ship.

42. a) Let Z_1, Z_2 and Z_3 be complex numbers such that $|Z_1|=|Z_2|=|Z_3| = r>0$ and $Z_1+Z_2+Z_3\neq 0$ prove that $\left|\frac{Z_1Z_2+Z_2Z_3+Z_3Z_1}{Z_1+Z_2+Z_3}\right| = r$.

(OR)

b) Find the centre, vertices, foci and directrices of the conic $9x^2 + 16y^2 + 36x - 32y - 92 = 0$.

43. a) ~~Solve~~ the equation $x^4 - 10x^3 + 26x^2 - 10x + 1 = 0$.

(OR)

b) Find the non-parametric form of vector equation and cartesian equation of the plane passing through the point (1, -2, 4) and perpendicular to the plane $x + 2y - 3z = 11$ and parallel to the line $\frac{x+7}{3} = \frac{y+3}{-1} = \frac{z}{1}$.

44. a) ~~Solve~~ :- $\tan^{-1}\left(\frac{x-1}{x+2}\right) + \tan^{-1}\left(\frac{x+1}{x+2}\right) = \frac{\pi}{4}$.

(or)

b) Find the area of the region bounded by the curve $\sqrt{x}, \sqrt{y} = \sqrt{a}$, x, y > 0 and the co-ordinate axes.

45. a) Evaluate $\underset{x\to\infty}{Lim}(1+2x)\left(\frac{1}{2\log x}\right)$.

(OR)

b) If $v(x, y) = \log\left(\frac{x^2+y^2}{x+y}\right)$, prove that $x\frac{dv}{dx} + y\frac{dv}{dy} = 1$.

$$\frac{1}{96.85} \qquad \frac{1192}{10872}$$

46. Evaluate :- $\int_1^4 (2x^2+3)\, dx$ as a limit of sum.

(OR)

The mean and standard deviation of a binomial variate X are respectively 6 and 2. Find (i) the probability mass function (ii) P(X=3) (iii) P(X≥2).

47. a) Assume that the rate at which radioactive nuclei decay is proportional to the number of such nuclei that are present in a given sample. In a certain sample, 10% of the original number of radioactive nuclei have undergone disintegration in a period of 100 years. What percentage of the original radioactive nuclei will remain after 1000 years?

$\frac{9^{10}}{10^{8}}$ % of the Radioactive element will remain after 1000 years

(OR)

b) Verify (i) the closure property (ii) communicative property (iii) associative property (iv) existance of identity and (v) existence of inverse for the operation +5 on Z_5 using table corresponding to addition modulo 5.
