FIRST REVISION TEST - 2024

A Standard XII Reg No.

MATHEMATICS

Time : 3.00 hrs Part – I *Marks : 90*

I. Choose the correct answer: **20 x 1 = 20**

1. A zero of $x^3 + 64$ is
   a) 0 b) 4 c) 4i d) –4
2. If $\left(\frac{1-i}{1+i}\right)^{201} = a + ib$ then (a, b) is
   a) (2, –1) b) (1, 0) c) (0, 1) d) (–1, 2)
3. The area of the triangle formed by the complex numbers z, iz and z+iz in the Argand's diagram is
   a) $\frac{1}{2}|z|^2$ b) $|z|^2$ c) $\frac{3}{2}|z|^2$ d) $2|z|^2$
4. If the rank of the matrix $\begin{pmatrix} 1 & 0 & -1 \\ 2 & 5 & \lambda \\ 0 & 0 & 7 \end{pmatrix}$ is 3 then the value of λ is
   a) 1 b) 0 c) 4 d) any real number
5. If A^TA^{-1} is symmetric, then A^2 =
   a) A^{-1} b) $(A^T)^2$ c) A^T d) $(A^{-1})^2$
6. $\sin^{-1}x - \cos^{-1}(-x)$ =
   a) $-\pi/2$ b) $\pi/2$ c) $-3\pi/2$ d) $3\pi/2$
7. $\sin(\tan^{-1}x)$, $|x| < 1$ is equal to
   a) $\frac{x}{\sqrt{1-x^2}}$ b) $\frac{1}{\sqrt{1-x^2}}$ c) $\frac{1}{\sqrt{1+x^2}}$ d) $\frac{x}{\sqrt{1+x^2}}$
8. The circle $x^2+y^2 = 4x + 8y + 5$ intersects the line $3x - 4y = m$ at two distinct points if
   a) $15 < m < 65$ b) $35 < m < 85$ c) $-85 < m < -35$ d) $-35 < m < 15$
9. An ellipse has OB as semi minor axis, F and F' its foci and the angle FBF' is a right angle. Then the eccentricity of the ellipse is
   a) $1/\sqrt{2}$ b) $1/2$ c) $1/4$ d) $1/\sqrt{3}$
10. If the volume of the parallele piped with $\vec{a}+\vec{b}$, $\vec{b}+\vec{c}$, $\vec{c}+\vec{a}$ as coterminous edges is 8 cubic units, then the volume of the parallelepiped with $(\vec{a}+\vec{b})-(\vec{b}+\vec{c})$, $(\vec{b}+\vec{c})-(\vec{c}+\vec{a})$ and $(\vec{c}+\vec{a})-(\vec{a}+\vec{b})$ as coterminous edges is
    a) 8 cubic units b) 512 cubic units c) 64 cubic units d) 24 cubic units
11. If the length of the perpendicular from the orgin to the plane $2x+3y+\lambda z = 1$ $\lambda > 0$ is $1/5$, then the value of λ is
    a) $2\sqrt{3}$ b) $3\sqrt{2}$ c) 0 d) 1

12 The abscissa of the point on the curve $f(x) = \sqrt{8 - 2x}$ at which the slope of the tangent is -0.25?

a) -8 b) -4 c) -2 d) 0

13 The function $\sin^4 x + \cos^4 x$ is increasing in the interval

a) $\left[\frac{5\pi}{8}, \frac{3\pi}{4}\right]$ b) $\left[\frac{\pi}{2}, \frac{5\pi}{8}\right]$ c) $\left[\frac{\pi}{4}, \frac{\pi}{2}\right]$ d) $\left[0, \frac{\pi}{4}\right]$

14 If $g(x, y) = 3x^2 - 5y + 2y^2$, $x(t) = e^t$ and $y(t) = \cos t$ then $\frac{dg}{dt}$ is equal to

a) $6e^{2t} + 5\sin t - 4\cos t \sin t$ b) $6e^{2t} - 5\sin t + 4\cos t \sin t$

c) $3e^{2t} + 5\sin t + 4\cos t \sin t$ d) $3e^{2t} - 5\sin t + 4\cos t \sin t$

15 The value of $\int_0^1 x(1-x)^{99}\,dx$

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

16 The area beween the ellipse $\frac{x^2}{25} + \frac{y^2}{9} = 1$ and its auxiliary circle is

a) 6π b) 20π c) 10π d) 12πs

17 The differential equation of the family of curves $y = Ae^x + Be^{-x}$, where A and B are arbitrary constants is

a) $\frac{d^2y}{dx^2} + y = 0$ b) $\frac{d^2y}{dx^2} - y = 0$ c) $\frac{dy}{dx} + y = 0$ d) $\frac{dy}{dx} - y = 0$

18. If a compound statement involves 3 simple statement, then the number of rows in the truth table is

a) 9 b) 8 c) 6 d) 3

19 A random variable X has binomial distribution with $n = 25$ and $p = 0.8$ then standard deviaiton of X is

a) 6 b) 4 c) 3 d) 2

20. If $\sin x$ is the integrating factor of the linear differential equation $\frac{dy}{dx} + Py = Q$ then P is

a) $\log \sin x$ b) $\cos x$ c) $\tan x$ d) $\cot x$

Part - II

II. **Answer any 7 questions. (Q.No.30 is compulsory)** **7 x 2 = 14**

21. Find rank of the matrix by using minor method $\begin{bmatrix} 1 & -2 & 1 & 0 \\ 3 & -6 & -3 & 1 \end{bmatrix}$

22. Construct the cubic equation with roots 2, $\frac{1}{2}$ and 1

23. Find the domain of the $\tan^{-1}\sqrt{9 - x^2}$
24. If $|\vec{a} + \vec{b}| = 60$, $|\vec{a} - \vec{b}| = 40$ and $|\vec{a}| = 22$ then find $|\vec{b}|$
25. Suppose of (x) is differentiable function for all x with $f'(x) \leq 29$ and $f(2) = 17$. What is the maximum value of f(7)?
26. If $w(x,y) = x^3 - 3xy + 2y^2$, $x, y \in R$, find the linear approximation for w at $(1, -1)$
27. Evaluate : $\int_0^\infty e^{-ax} x^n \, dx$
28. Find the differential equation for the family of all straight lines passing through the origin.
29. Four coins are tossed once find the probability mass function for number of heads.
30. Prove De Morgan's law by using Truth table.

Part - III

III. Answer any 7 questions. (Q.No.40 is compulsory) **7 x 3 = 21**

31. If $A = \frac{1}{9}\begin{bmatrix} -8 & 1 & 4 \\ 4 & 4 & 7 \\ 1 & -8 & 4 \end{bmatrix}$, Prove that $A^{-1} = A^T$
32. Prove by Vector method that the area of the quadrilateral ABCD having diagonal AC and BD is $\frac{1}{2}|\overrightarrow{AC} \times \overrightarrow{BD}|$
33. Represent the complex number $1 + i\sqrt{3}$ in polar form.
34. If p and q are the roots of the equation $x^2 + nx + n = 0$, show that $\sqrt{p/q} + \sqrt{q/p} + \sqrt{n/l} = 0$
35. Find the value of $2\cos^{-1}\left(\frac{1}{2}\right) + \sin^{-1}\left(\frac{1}{2}\right)$
36. If the equation $3x^2 + (3-p)xy + qy^2 - 2px = 8pq$ represents a circle, find p and q. Also determine the centre and radius of the circle.
37. If the radius of the sphere, with radius 10.cm, has to decrease by 0.1 cm approximately how much with it's volume decrease?
38. Evaluate: $\int_0^{\pi/2} \frac{dx}{1 + 5\cos^2 x}$
39. Find the mean and variance of random variable, x whose probability density function is

$$f(x) = \begin{cases} \lambda e^{-\lambda x} & , x \geq 0 \\ 0 & , \text{otherwise} \end{cases}$$

40. Find the local extrema of the function $f(x) = x^4 + 32x$.

Part - IV

$7 \times 5 = 35$

IV. **Answer all the questions.**

41. a) Determine the values of λ for which the following system of equations $x + y + 3z = 0$; $4x + 3y + \lambda z = 0$ and $2x + y + 2z = 0$ has (i) unique solution (ii) a non–trivial solution

(OR)

b) Solve the equation $z^3 + 8i = 0$, $z \in C$

42. a) Solve: $(x - 5)(x - 7)(x + 6)(x + 4) = 504$

(OR)

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

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

(OR)

b) If $f(x, y) = \tan^{-1}\left(\frac{x}{y}\right)$, find fx, fy and show that fxy = fyx.

44. a) If $\vec{a} = 2\vec{i} + 3\vec{j} - \vec{k}$, $\vec{b} = -2\vec{i} + 5\vec{k}$, $\vec{c} = \vec{j} - 3\vec{k}$ then find $(\vec{a} \times \vec{b}) \times \vec{c}$ and $\vec{a} \times (\vec{b} \times \vec{c})$. Also verify whether they are equal.

(OR)

b) Show that the lines $\frac{x-3}{3} = \frac{y-3}{-1}$, $z - 1 = 0$ and $\frac{x-6}{2} = \frac{z-1}{3}$, $y - 2 = 0$ inersect and also find the point of intersection.

45. a) Show that the two curves $x^2 - y^2 = r^2$ and $xy = c^2$ where c, r are constants cut orthogonally.

(OR)

b) A hollow cone with base radius a cm and height b cm is placed on a table. Show that the volume of the largest cylinder that can be hidden underneath is $\frac{4}{9}$ times volume of the cone.

46. a) Find the area of the region common to the circle $x^2+y^2=16$ and the parabola $y^2 = 6x$.

(OR)

b) In a murder investingation, a corpse was found by a detective at exactly 8 pm. Being alert, the detective also measured the body temperature and found it to be 70° F. Two hours later the detective measured the body temperature again and found it to be 60°F. If the room temperature is 50°F and assuming that the body temperature of the person before death was 98.6°F at what time murder occur?

[log 2.43 = 0.88789, log (0.5) = –0.69315]

47. a) The mean and variance of a binomial distribution X are respectively 2 and 1.5 Find (i) P(X = 0) (ii) P(X = 1) (iii) $P(X \geq 1)$

(OR)

b) Prove that $P \rightarrow (\neg q \vee r) \equiv \neg p \vee (\neg q \vee r)$ using truth table.

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