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12th Public Creative Questions (March 2020 to July 2026)

One Marks:

1. The vertex of the parabola $x^2 = 8y-1$ is : **Mar- 2020**

   a) $\left(0, -\frac{1}{8}\right)$ b) $\left(-\frac{1}{8}, 0\right)$ c) $\left(\frac{1}{8}, 0\right)$ d) $\left(0, \frac{1}{8}\right)$

2. $\vec{r} = s\hat{\imath} + t\hat{\jmath}$ is the equation of (s,t are parameters): **Mar- 2020**

   a) zox plane b) a straight line joining the points $\hat{\imath}$ and $\hat{\jmath}$ c) xoy plane d) yoz plane

3. Arg(0) is : **Mar- 2020**

   a) ∞ b) 0 c) π d) undefined

4. The least possible perimeter (in meter) of a rectangle of area 100 m^2 is : **Mar- 2020**

   a) 50 b) 10 c) 20 d) 40

5. The order and degree of the differential equation $\frac{dx}{dy} + \frac{dy}{dx} = 0$ are : **Mar- 2020**

   a) 2, degree not defined b) 1,2 c) 2,1 d) 2,2

6. If a = 3+i and z = 2-3i, then the points on the argand diagram representing az, 3az, -az are: **Sep- 2020**

   a) Vertices of a right angled triangle b) Vertices of an equilateral triangle
   c) Vertices of an isosceles triangle d) Collinear

7. The length of the latus rectum of the parabola y^2-4x+4y+8 = 0 is : **Sep- 2020**

   a) 8 b) 6 c) 4 d) 2

8. The value of $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \frac{sinx}{2+cosx}$ dx is **Sep- 2020**

   a) 0 b) 2 c) log2 d) log4

9. If cosx is the integrating factor of the differential equation $\frac{dy}{dx} + Py = Q$, then P is **Sep- 2020**

   a) -cotx b) cotx c) $\tan x$ d) –tanx

10. In 16 throws of a die getting an even number is considered a success, then the variance of the successes is: **Sep- 2020**

    a) 4 b) 6 c) 2 d) 256

11. The inverse of $\begin{bmatrix} 3 & 1 \\ 5 & 2 \end{bmatrix}$ is **Aug- 2021**

    a) $\begin{bmatrix} 3 & -1 \\ -5 & -3 \end{bmatrix}$ b) $\begin{bmatrix} 2 & -1 \\ -5 & 3 \end{bmatrix}$ c) $\begin{bmatrix} -3 & 5 \\ 1 & -2 \end{bmatrix}$ d) $\begin{bmatrix} -2 & 5 \\ 1 & -3 \end{bmatrix}$

12. The centre of the hyperbola $\frac{(x-1)^2}{16} - \frac{(y+1)^2}{25} = 1$ is **Aug- 2021**

    a) $\left(\frac{1}{2}, -\frac{1}{2}\right)$ b) (-1,1) c) (1,-1) d) (0,0)

13. The position of a particle ‘s’ moving at any time t is given by s(t) = $5t^2$ - 2t – 8. The time at which the particle is at rest, is **Aug- 2021**

    a) 1 b) 0 c) 5 d) $\frac{1}{5}$

14. The function $f(x) = x^2$ in the interval $[0,\infty)$ is **Aug- 2021**

    a) cannot be determined b) increasing function
    c) increasing and decreasing function d) decreasing function

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15. $\int_0^{\frac{\pi}{2}} \sin^7 x\, dx$ = **Aug- 2021**

a) $\frac{\pi}{2}$ b) $\int_0^{\frac{\pi}{2}} \cos^7 x\, dx$ c) 0 d) 1

16. The value of $\sin^{-1}\left(\frac{1}{2}\right) + \cos^{-1}\left(\frac{1}{2}\right)$ is **Aug- 2021**

a) 0 b) $\frac{\pi}{2}$ c) $\frac{\pi}{3}$ d) π

17. The value of the complex number $(i^{25})^3$ is equal to **Aug- 2021**

a) 1 b) i c) –i d) -1

18. If we measure the side of a cube to be 4cm with an error of 0.1cm, then the error in calculation of the volume is (in cube cm) **Aug- 2021**

a) 2 b) 0.4 c) 4.8 d) 0.45

19. Which of the following is incorrect? **May- 2022**

a) If A is a square matrix of order n and λ is a scalar, then adj(λA) = λ^nadj(A).

b) Adjoint of a symmetric matrix is also a symmetric matrix.

c) A(AdjA) = (AdjA)A = $|A|$I

d) Adjoint of a diagonal matrix is also a diagonal matrix.

20. The length of the latus rectum of the parabola x^2=24y is: **May- 2022**

a) 8 b) 24 c) 6 d) 12

21. Which one of the following is not true in the case of discrete random variable X? **May- 2022**

a) $\lim_{x\to\infty} F(x)$ = F(∞) = 1 b) 0 ≤ F(x) ≤ 1 for all x∈ R

c) F(x) is real valued decreasing function d) $\lim_{x\to-\infty} F(x)$ = F(−∞) = 0

22. The angle between the lines $\frac{x-4}{2} = \frac{y}{1} = \frac{z+1}{-2}$ and $\frac{x-1}{4} = \frac{y+1}{-4} = \frac{z-2}{2}$ is **May- 2022**

a) $\frac{\pi}{2}$ b) $\frac{\pi}{4}$ c) $\frac{2\pi}{3}$ d) $\frac{\pi}{3}$

23. The principal value of $\cos^{-1}\left(\frac{\sqrt{3}}{2}\right)$ is: **May- 2022**

a) $\frac{\pi}{2}$ b) $\frac{\pi}{3}$ c) $\frac{5\pi}{6}$ d) $\frac{\pi}{6}$

24. If the vectors $2\hat{\imath} - \hat{\jmath} + 3\hat{k}$, $3\hat{\imath} + 2\hat{\jmath} + \hat{k}$ and $\hat{\imath} + m\hat{\jmath} + 4\hat{k}$are coplanar, then the value of m is: **May- 2022**

a) 2 b) 3 c) -2 d) -3

25. The value of $\sum_{n=1}^{12} i^n$ is: **May- 2022**

a) 0 b) 1 c) -1 d) i

26. The general equation of a circle with centre (-3,-4) and radius 3 units is : **May- 2022**

a) $x^2 + y^2 - 6x + 8y - 16 = 0$ b) $x^2 + y^2 - 6x - 8y + 16 = 0$

c) $x^2 + y^2 + 6x - 8y + 16 = 0$ d) $x^2 + y^2 + 6x + 8y + 16 = 0$

27. Which of the following is incorrect? **May- 2022**

a) If A is a square matrix of order n, and λ is a scalar, then Adj(λA) =

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λ^nAdj(A).

b) Adjoint of a symmetric matrix is also a symmetric matrix.

c) A(adjA) = (adjA)A = $|A|$I

d) Adjoint of a diagonal matrix is also a diagonal matrix.

28. The principal value of $\cos^{-1}\left(cos\frac{\pi}{6}\right)$ is: **July 2022**

a) $\frac{\pi}{6}$ b) $\frac{5\pi}{6}$ c) $\frac{-\pi}{6}$ d) $\frac{\pi}{3}$

29. The eccentricity of the hyperbola $\frac{x^2}{16}-\frac{(y-3)^2}{4}=1$ is **July 2022**

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

30. If a fair die is thrown once then the probability to get a prime number on the face is **July 2022**

a) 0 b) $\frac{1}{2}$ c) $\frac{1}{4}$ d) $\frac{1}{6}$

31. A random variable X takes the probability mass function **July 2022**

x	-2	3	1
P(X=x)	$\frac{\lambda}{6}$	$\frac{\lambda}{4}$	$\frac{\lambda}{12}$

The value of λ is

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

32. If $3\cos^{-1}x = \cos^{-1}(4x^3-3x)$, **Mar- 2023**

a) $x \in \left(\frac{1}{2},1\right)$ b) $x \in \left[\frac{1}{2},1\right]$ c) $x \in (-\infty,1]$ d) $x \in [\frac{1}{2},\infty)$

33. The number of normal that can be drawn from a point to the parabola $y^2 = 4ax$ is: **Mar- 2023**

a) 3 b) 2 c) 0 d) 1

34. The value of $\int_0^{\frac{\pi}{3}} tanx\,dx$ is : **Mar- 2023**

a) –log2 b) log2 c) –log3 d) log3

35. The principle value of $\sin^{-1}\left(\frac{1}{2}\right)$ is: **Mar- 2023**

a) $\frac{-\pi}{6}$ b) 0 c) $\frac{-\pi}{2}$ d) $\frac{\pi}{2}$

36. If $|adj(adjA)| = |A|^{16}$, then the order of the square matrix A is : **Mar- 2023**

a) 2 b) 3 c) 5 d) 4

37. The value of $\left(\frac{1+i}{\sqrt{2}}\right)^8+\left(\frac{1-i}{\sqrt{2}}\right)^8$ is: **Mar- 2023**

a) 8 b) 4 c) 2 d) 6

38. A square matrix A of order n has inverse if and only if: **Mar- 2023**

a) ρ(A) > n b) ρ(A) = n c) ρ(A) ≠ n d) ρ(A) < n

39. The number of rows in the truth table of $(p \vee q) \wedge (p \vee r)$ **Mar- 2024**

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

40. The type of conic section for x^2-3 = 5x + 3y is : **Mar- 2024**

a) hyperbola b) ellipse c) circle d) parabola

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41. The horizontal asymptote of f(x) = $\frac{1}{x}$ is : **Mar- 2024**

a) x = c b) y = 0 c) y = c d) x = 0

42. The value of Var(3) is : **Mar- 2024**

a) 0 b) 3 c) Var(3) d) 9

43. If A is a non-singular matrix of order 3×3 and $|A| = 5$ then $|A^{-1}|$ is : **Mar - 2025**

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

44. If f(x) > 0 for all x and g(x) = log(f(x)), then dg is: **Mar - 2025**

a) $\frac{1}{f(x)}\,dx$ b) $\frac{1}{f(x)}f'(x)\,dx$ c) $\frac{1}{x}\,dx$ d) $\frac{1}{x}f(x)\,dx$

45. The square root if i are: **Mar - 2025**

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

46. The order and degree of differential equation $\sqrt{\frac{dy}{dx}} - 4\frac{dy}{dx} - 7x = 0$ are respectively: **Mar – 2025**

a) 1, 2 b) 2, 1 c) 2,2 d) 1, 1

47. Let A be a non-singular square matrix of order *n.* Which one of the following is incorrect? **June -25**

(a) adj(adjA) = $|A|^{n-2}$ A (b) $|adjA| = A^{n-1}$ (c) |adj(adjA)| = $|A|^{(n-1)^2}$ (d) $(adjA)^T = adj(A^T)$

48. $\text{cis}\left(\frac{28\pi}{5}\right)$ is equal to: (a) $\text{cis}\left(\frac{-2\pi}{5}\right)$ (b) $\text{cis}\left(\frac{2\pi}{5}\right)$ (c) $\text{cis}\left(\frac{3\pi}{5}\right)$ (d) $\text{cis}\left(\frac{-3\pi}{5}\right)$ **June -25**

49. If f(x) = x is an identity function then the differential df is : **June -25**

(a) dy (b) dx (c) –dy (d) -dx

50. The order and degree of the differential equation $3\left(\frac{d^2y}{dx^2}\right) = \left[4 + \left(\frac{dy}{dx}\right)^2\right]^{\frac{3}{2}}$ are: **June -25**

(a) 2,1 (b) 2,2 (c) 3, 3 (d) 3,2

51. If x < 0 , then $tan^{-1}\left(\frac{1}{x}\right)$ is equal to : **Mar- 26**

(a) $-\pi + \cot^{-1} x$ (b) $\tan^{-1} x$ (c) $-\pi + \tan^{-1} x$ (d) $\cot^{-1} x$

52. If the image of the point A(1,2,3) with respect to the plane $\vec{r}.(\hat{\imath} + 2\hat{\jmath} + 4\hat{k}) = 38$ is $A'(3,6,11)$, then the foot of the perpendicular from the point A to the given plane is : **Mar- 26**

(a) (2,5,7) (b) (2,3,7) (c) (2,-4,7) (d) (2,4,7)

53. The eccentricity of the circle is: **Mar- 26**

(a) $\frac{1}{2}$ (b) 0 (c) 2 (d) 1

54. Let A = {(x,y) / a < x < b, c < y < d } $\subset \mathbb{R}^2$. If the function u : A$\rightarrow \mathbb{R}^2$ is harmonic in A, then : **Mar- 26**

(a) $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0 \;\forall$ (x,y) ∈ A (b) $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 1 \;\forall$ (x,y) ∈ A

(c) $\frac{\partial^2 u}{\partial x^2} - \frac{\partial^2 u}{\partial y^2} = 0 \;\forall$ (x,y) ∈ A (d) $\frac{\partial^2 u}{\partial x^2} - \frac{\partial^2 u}{\partial y^2} = 1 \;\forall$ (x,y) ∈ A

55. The principal argument of the complex number $\frac{-10}{1+i\sqrt{3}}$ is : **July -26**

(a) $-\pi$ (b) π (c) $\frac{2\pi}{3}$ (d) $-\frac{\pi}{3}$

56. $\hat{\imath} - 3\hat{\jmath} + 4\hat{k}$, $2\hat{\imath} - \hat{\jmath} + 3\hat{k}$ and $m\hat{\imath} + 2\hat{\jmath} + \hat{k}$ are coplanar, then the value of m is: **July -26**

(a) 2 (b) -2 (c) 3 (d) -3

57. Which of the following is incorrect? **July -26**

(a) If f is a constant function, then df = 0

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(b) If f(x) = x identity function, then df = 1dx

(c) If f is differential and cϵR, then d(cf) = cf'(x)dx

(d) If f(x) < 0 for all x and g(x) = log(f(x)), then dg = $\frac{f'(x)}{f(x)}dx$

58. Which one of the following differential equation has order 1 and degree 1? **July -26**

(a) $e^{\frac{dy}{dx}} + \frac{dy}{dx} = 0$ (b) $y\left(\frac{dy}{dx}\right) = \frac{x}{\left(\frac{dy}{dx}\right)+\left(\frac{dy}{dx}\right)^3}$ (c) $\sqrt{cosx}$(dx-dy) - $\sqrt{sinx}$(dx+dy) = 0

(d) $\sqrt{\frac{dy}{dx}} - 4\frac{dy}{dx}$ -7x = 0

Two marks, three marks and five mark questions:

1. If (1+i)(1+2i)…….(1+ni) = x+iy, then prove that 2.5.10…….(1+n^2) = x^2+y^2 **Mar- 2020-2M**
2. Prove that the identity element is unique if it exists. **Mar- 2020-2M**
3. Prove that $\int_0^{\frac{\pi}{2}} \frac{f(sinx)}{f(sinx)+f(cosx)}$ dx = $\frac{\pi}{4}$ **Mar- 2020-2M**
4. Find the equation of the parabola if the curve is open leftward , vertex is (2,1) and passing through the point (1,3). **Mar- 2020-2M**
5. Find the critical numbers (only x values) of the function f(x) = $x^{\frac{4}{5}}$ (x-4)^2. **Mar- 2020-3M**
6. Let X be a continuous random variable and f(x) is defined as:
   $f(x) = \begin{cases} kx(1-x)^{10}, & 0 < x < 1 \\ 0, & \text{otherwise} \end{cases}$, find the value of *k* . **Mar- 2020-3M**
7. If the lines $\frac{x-x_1}{l_1} = \frac{y-y_1}{m_1} = \frac{z-z_1}{n_1}$ and $\frac{x-x_2}{l_2} = \frac{y-y_2}{m_2} = \frac{z-z_3}{n_2}$ lie on the same plane, then write the number of ways to find the Cartesian equation of the above plane and explain in detail. **Mar- 2020-3M**
8. Draw the graph of cosx in [0,π] and $\cos^{-1}$x in [-1,1]. **Mar- 2020-5M**
9. A square shaped thin material with area 196 sq. units to make into an open box by cutting small equal squares from the four corners and folding the side upward. Prove that the length of the side of a removed square is $\frac{7}{3}$ when the volume of the box is maximum. **Mar- 2020-5M**
10. Three fair coins are tossed once. Find the probability mass function, mean and variance for number of heads occurred. Verify the results by binomial distribution. **Mar- 2020-5M**
11. Find the least positive integer n such that $\left(\frac{1+i}{1-i}\right)^n$ = 1. **Sep- 2020-2M**
12. Find the differential equation of the family of y = ax^2+bx+c where a,b are parameters and c is a constant. **Sep- 2020-2M**
13. Show that if x = rcosθ, y = rsinθ, then $\frac{\partial r}{\partial x}$ is equal to cosθ. **Sep- 2020-2M**
14. Suppose that $z = ye^{x^2}$, where $x = 2t$ and $y = 1-t$, then find $\frac{dz}{dt}$. **Sep- 2020-3M**
15. Show that ((~q)$\wedge$p))$\wedge$q is a contradiction. **Sep- 2020-3M**
16. Prove that arg(z_1z_2) = arg(z_1) + arg(z_2) **Sep- 2020-5M**

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17. Draw the graph of tanx in $\left(-\frac{\pi}{2},\frac{\pi}{2}\right)$ and $\tan^{-1}x$ in $(-\infty,\infty)$. **Sep- 2020-5M**

18. A Car A is travelling from west at 50 km/hr and Car B is travelling towards north at 60 km/hr. Both are headed for the intersection of the two roads. At what rate are the Cars approaching each other when Car A is 0.3 kilometers and Car B is 0.4 kilometers from the intersection? **Sep- 2020-5M**

19. Find the area of region bounded by the ellipse $\frac{x^2}{25}+\frac{y^2}{16}=1$ and its latus rectums. **Sep- 2020-5M**

20. If α and β are the roots of x^2-5x+6 = 0 then prove that α^2- β^2 = $\pm$5 **Aug- 2021-2M**

21. Show that the differential equation corresponding to y = Asinx, where A is an arbitrary constant is y = y'tanx. **Aug- 2021-2M**

22. A force $13\hat{\imath}+10\hat{\jmath}-3\hat{k}$ acts on a particle which is displaced from the point with position vector $4\hat{\imath}-3\hat{\jmath}-2\hat{k}$ to the point with position vector $6\hat{\imath}+\hat{\jmath}-3\hat{k}$. Show that the work done by the force is 69 units. **Aug- 2021-3M**

23. An egg of a particular bird is spherical in shape. If the radius to the inside of the shell is 4 mm and radius to the outside of the shell is 4.2 mm, prove that the approximate volume of the shell is 12.8π mm3. **Aug- 2021-3M**

24. Show that $\int_0^1 \frac{\sqrt{x}}{\sqrt{1-x}+\sqrt{x}}dx=\frac{1}{2}$ **Aug- 2021-3M**

25. Solve the system of equations $x-y+2z=2, 2x+y+4z=7, 4x-y+z=4$ by Cramer's rule. **Aug- 2021-5M**

26. Find the eccentricity, centre ,vertices and foci of the ellipse $\frac{x^2}{16}+\frac{y^2}{9}=1$ and also draw the rough diagram. **Aug- 2021-5M**

27. Show that the Cartesian equation of the plane passing through the points (1,2,3) and (2,3,1) and also perpendicular to the plane $3x-2y+4z+5=0$ is $2y+z-7=0$ **Aug- 2021-5M**

28. Show that the distance from the origin to the plane 3x+6y+2z+7 = 0 is 1. **May-2022-2M**

29. Show that the differential equation of the family of curves $y = Ae^x + Be^{-x}$, where A and B are arbitrary constants is $\frac{d^2y}{dx^2}$ - y = 0. **May 2022 – 2M**

30. Prove that the general equation of the circle whose diameter is the line segment joining the points (-4,-2) and (-1,-1) is x^2+y^2 + 5x + 3y + 6 = 0. **May 2022 – 3M**

31. Cramer's rule is not applicable to solve the system 3x+y+z = 2, x-3y+2z = 1, 7x-y+4z = 5. Why? **May 2022 – 5M**

32. Prove that the local minimum values for the function f(x) = $4x^6$ - $6x^4$ attain at -1 and 1. **May 2022 – 5M**

33. The distribution function of a continuous random variable X is: **May 2022 – 5M**

$$F(x)=\begin{cases}0, & x<1\\ \frac{x-1}{4}, & 1\le x\le 5\\ 1, & x>5\end{cases}$$

Find (i)$P(X<3)$ (ii)$P(2<X<4)$ (iii)$P(3\le X)$

34. If α and β are the roots of x^2+5x+6 = 0 then show that $\alpha^2+\beta^2$ = 13 **July- 2022-2M**

35. Find the value of $\sin^{-1}(1)+\cos^{-1}(1)$. **July- 2022-2M**

36. Show that $y = ae^x + be^{-x}$ is a solution of the differential equation y''-y = 0.

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July- 2022-2M

37. Form the differential equation of the curve y = ax^2+bx+c where a,b and c are arbitrary constant. **July- 2022-2M**

38. Prove that the roots of the equation x^4 - 3x^2- 4 = 0 are $\pm$2, $\pm$i. **July- 2022-3M**

39. Prove that $\int_0^1 xe^x dx$ = 1 **July- 2022-3M**

40. Show that the area between the parabola y^2 = 16x and its latus rectum (using integration) is $\frac{128}{3}$. **July- 2022-5M**

41. Show that the Cartesian equation of the plane passing through the points (a, 0, 0), (0, b, 0), (0, 0, c) is $\frac{x}{a}+\frac{y}{b}+\frac{z}{c}$ = 1. **July- 2022-5M**

42. Express $e^{cos\theta+isin\theta}$ in a+ib form. **Mar- 2023-2M**

43. If a+b+c = 0 and a,b,c are rational numbers then, prove that the roots of the equation (b+c-a)x^2+(c+a-b)x+(a+b-c) = 0 are rational numbers. **Mar- 2023-3M**

44. Find the maximum value of $\frac{logx}{x}$. **Mar- 2023-5M**

45. Find the smaller area of the region common to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}$ = 1 and the line $\frac{x}{a}+\frac{y}{b}$ = 1. **Mar- 2023-5M**

46. Show that the vectors $2\hat{\imath}-\hat{\jmath}+3\hat{k}$, $\hat{\imath}-\hat{\jmath}$ and $3\hat{\imath}-\hat{\jmath}+6\hat{k}$ are coplanar. **Mar- 2024-2M**

47. If A = $\begin{bmatrix} 2 & -1 & 3 \\ -5 & 3 & 1 \\ -3 & 2 & 3 \end{bmatrix}$, then find $|adj(adjA)|$. **Mar- 2024-3M**

48. Find the vector and Cartesian equation of the plane containing $\frac{x-2}{2}=\frac{y-2}{3}=\frac{z-1}{3}$ and parallel to the $\frac{x+1}{3}=\frac{y-1}{2}=\frac{z+1}{1}$. **Mar- 2024-5M**

49. Show that $p \leftrightarrow q \equiv ((\neg p) \vee q) \wedge ((\neg q) \vee p)$ **Mar- 2024-5M**

50. Find a polynomial equation of minimum degree with rational coefficients having i-2 as a root. **Mar – 2025-2M**

51. If $f(x) = \sin x$, then prove that $\int_0^{\pi} f(x)dx = 2\int_0^{\frac{\pi}{2}} f(x)dx$ **Mar –2025-2M**

52. Find the Taylor's series about $x = 2$ for $f(x) = x^3 + 2x + 1, (-\infty < x < \infty)$ **Mar – 2025 – 3M**

53. Let Q be the set of all Rational numbers. If * is a binary operation defined on Q as $a * b = a + b - ab + 7$ and $\left(\frac{3}{2}\right) * m = \frac{87}{10}$, then find the value of m. **Mar – 2025-3M**

54. During war,1 ship out of 9 was sunk on an average in making a certain voyage. What was the probability that: **Mar – 2025-5M**

(i) Exactly 3 out of a convoy of 6 ships would arrive safely?

(ii) No ships arrive safely from a convoy of 4 ships.

55. Find the equation of the ellipse whose foci are (2, 1), (-2, 1) and length of the latus rectum is 6. **Mar – 2025-5M**

56. Using truth table, prove that p $\wedge$ (q$\vee$r) $\equiv$ (p $\wedge$ q) $\vee$ (p $\wedge$ r) **Mar – 2025-5M**

57. Solve : $x^4 - 5x^2 + 6 = 0$ **June – 2025 – 2M**

58. $\int_0^a \frac{dx}{9+x^2} = \frac{\pi}{12}$ then find 'a'. **June – 2025 – 2M**

59. Find the absolute maximum and absolute minimum of the function $f(x) = 2x^3 - 3x^2 - 12x + 5$ on $[-2,4]$ **June – 2025 – 3M**

60. On Z^+, define an operation $*$ by (a$*$b) = a^b + ab , $\forall$ a, b $\in Z^+$. Is $*$ a binary operation on Z^+? If so , find a when a$*$2 = 8. **June – 2025 – 3M**

61. A random variable X has the following probability mass function.

x	1	2	3	4	5	6	7
f(x)	k	2k	3k	2k	k^2	$2k^2$	$7k^2$+k

(i) Find 'k' (ii) Evaluate P(X < 4) (iii) Evaluate P(2 < X < 6)

(iv) If P(X $\leq$ x) > $\frac{1}{2}$, then find the minimum value of x. **June – 2025 – 5M**

62. Find the centre, vertices and foci of the ellipse $13x^2 + 49y^2 + 182x - 98y + 49 = 0$. **June – 2025 – 5M**

63. If f(x,y) = $cos^{-1}\left(\frac{x}{y}\right)$, then show that $f_y = \frac{x}{y\sqrt{y^2-x^2}}$ **Mar- 2026-2M**

64. If $\sqrt{Var(X)} = \frac{1}{2}$ then, find the value of Var (2X + 3) **Mar- 2026-2M**

65. If $\int_0^\infty e^{-x}x^n dx$ = 5!, then find the value of $\int_0^\infty e^{-x}x^{n-1}dx$ **Mar- 2026-3M**

66. If $z_1 = \overline{1+\iota}$ and $\bar{z}_2$ = 1 – i , find the inverse of $\left(\frac{z_1}{z_2}\right)^{2026}$ **Mar- 2026-3M**

67. Solve the equation $(x+1)(x+3)(x-2)(x-4)+21=0$ **Mar- 2026-5M**

68. Sketch the curve y = log(1+x) **Mar- 2026-5M**

69. The probability density function of X is given by $f(x) = ke^{-|x|}$,$-\infty < x < \infty$ then find the value of 'k' **July – 2026 – 2M**

70. Solve cos(2sin^{-1}x) = $\frac{1}{9}$, if x > 0. **July – 2026 – 3M**

71. Find the equations of the tangent and normal to ellipse $12x^2 + 9y^2 = 108$ when $\theta = \frac{\pi}{3}$ **July – 2026 – 5M**

72. Sand is poured at a rate of 50 cubic metre per minute forming a conical pile with a circular base whose half of the height and radius of the base are always equal. How fast is the radius of the pile increasing when the pile is 5 metre radius? **July – 2026 – 5M**

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