NTA_ABHYAS PAPER-1

Single Choice

1. If the roots of the equation $ax^2 + bx + c = 0$ are in the ratio m : n, then

(A) $mn\,b^2 = ac\,(m + n)^2$ (B) $b^2\,(m + n) = mn$
(C) $m + n = b^2mn$ (D) $mnc^2 = ab\,(m + n)^2$

2. The domain of definition of the funciton $y = 3e^{\sqrt{x^2-1}} \log(x-1)$ is

(A) $(1, \infty)$ (B) $[1, \infty]$ (C) $R - \{1\}$ (D) $(-\infty, -1) \cup (1, \infty)$

3. The value of $\int_{-1}^{1} (x-[x])\,dx$ (where [.] denotes greatest integer function) is

(A) 0 (B) 1 (C) 2 (D) None of these

4. A flag - staff of 5 meters high stands on a building of 25 meters height. For an observer at a height of 30 meters, the flag-staff and the building subtend equal angles. The distance of the observer from the top of the flag - staff is

(A) $\frac{5\sqrt{3}}{2}$ m (B) $5\sqrt{\frac{3}{2}}$ m (C) $5\sqrt{\frac{2}{3}}$ m (D) None of these

5. If $R = \{(x, y) | x, y \in Z, x^2 + y^2 \le 4\}$ is a relation in Z, then domain of R is

(A) {0, 1, 2} (B) {0, –1, –2} (C) {–2, –1, 0, 1, 2} (D) None of these

6. If 5^{97} is divided by 52, then the remainder obtained is

(A) 3 (B) 5 (C) 4 (D) 0

7. If $y = 4x - 5$ is tangent to the curve $y^2 = px^3 + q$ at (2, 3) then (p, q) is

(A) (2, 7) (B) (–2, 7) (C) (–2, –7) (D) (2, – 7)

8. The number of discontinuity of the greatest integer function

$f(x) = [x], x \in \left(-\frac{7}{2}, 100\right)$ is equal to

(A) 104 (B) 102 (C) 101 (D) 103

9. The number of ways of selecting 15 teams from 15 men and 15 women, such that each team consists of a man and a woman, is

(A) 1960 (B) 15! (C) $(15!)^2$ (D) 14!

10. If the general solution of the differential equation $y' = \frac{y}{x} + \phi\left(\frac{x}{y}\right)$, for some function ϕ, is given by $y \ln|cx| = x$, where c is an arbitrary constant. then ϕ (2) is equal to $\left(\text{here, } y' = \frac{dy}{dx}\right)$

(A) -4 (B) $-\frac{1}{4}$ (C) $\frac{1}{4}$ (D) 4

11. If $\sin^{-1}\frac{1}{3} + \sin^{-1}\frac{2}{3} = \sin^{-1} x$, then the value of x is

(A) 0 (B) $\frac{\left(\sqrt{5} - 4\sqrt{2}\right)}{9}$ (C) $\frac{\left(\sqrt{5} + 4\sqrt{2}\right)}{9}$ (D) $\frac{\pi}{2}$

12. If x and y are two distinct integers and n is a natural number then $x^n - y^n$ is divisible by

(A) $x^2 - y^2$ (B) $x + y$ (C) $x - y$ (D) None of these

13. The area bounded by the curves $y = (x-1)^2$, $y = (x+1)^2$ and $y = \frac{1}{4}$ is

(A) $\frac{1}{3}$ sq unit (B) $\frac{2}{3}$ sq unit (C) $\frac{1}{4}$ sq unit (D) $\frac{1}{5}$ sq unit

14. Number of roots of the equation $\cos^2 x + \frac{\sqrt{3}+1}{2}\sin x - \frac{\sqrt{3}}{4} - 1 = 0$ which lie in the inerval $[-\pi, \pi]$ is

(A) 2 (B) 4 (C) 6 (D) 8

15. Suppose that the side lengths of a triangle are three consecutive integers and one of the angles is twice another. The number of such triangles is/are

(A) 1 (B) 0 (C) 4 (D) 2

16. If $x = 33^n$, n is a positive integral value, then the probability that x will have 3 at its units place, is

(A) $\frac{1}{3}$ (B) $\frac{1}{4}$ (C) $\frac{1}{5}$ (D) $\frac{1}{2}$

17. If $y=\log_{10}x+\log_x 10+\log_x x$ then $\frac{dy}{dx}+\log_{10}10$, is equal to

(A) $\frac{1}{x\log_e 10}-\frac{\log_e 10}{x(\log_e x)^2}$ (B) $\frac{1}{x\log_e 10}-\frac{1}{x\log_{10} e}$

(C) $\frac{1}{x\log_e 10}-\frac{\log_e 10}{x(\log_e x)}$ (D) None of these

18. $z\in C$ satisfies the condition $|z|\geq 3$ the least value of $\left|z+\frac{1}{z}\right|$ is

(A) $\frac{3}{8}$ (B) $\frac{8}{5}$ (C) $\frac{8}{3}$ (D) $\frac{5}{8}$

19. If a, b, c, d, e, f are in arithmetic progression. Then $e-c$ is equal to
(A) $2(c-a)$ (B) $2(d-c)$ (C) $2(f-d)$ (D) $d-c$

20. $\int\frac{\ln(x+1)-\ln x}{x(x+1)}dx$ is equal to (where C is an aribitarary constant)

(A) $-\frac{1}{2}\left[\ln\left(\frac{x+1}{x}\right)\right]^2+C$ (B) $C-[\{\ln(x+1)\}^2-(\ln x)^2]$

(C) $-\ln\left[\ln\left(\frac{x+1}{x}\right)\right]+C$ (D) $-\ln\left(\frac{x+1}{x}\right)+C$

Numerical Value

21. If f(x) is a polynomial satisfying $f(x)f\left(\frac{1}{x}\right)=f(x)+f\left(\frac{1}{x}\right)$ and $f(2)>1$, then $\lim_{x\to 1}f(x)$ is

22. If $A=\begin{bmatrix}1&0&0\\0&1&1\\0&-2&4\end{bmatrix}, I=\begin{bmatrix}1&0&0\\0&1&0\\0&0&1\end{bmatrix}$ and $A^{-1}=\frac{1}{6}(A^2+cA+dI)$ then the sum of values of c and d is

23. The least value of the quadratic polynomial, $f(x)=(2p^2+1)x^2+2(4p^2-1)x+4(2p^2+1)$ for real value of p and x is

24. If A, B, C are in arithmetic progression and $B=\frac{\pi}{4}$, then $\tan A\tan B\tan C=$

25. The distance of the point $(-1, 1)$ from the line $12(x+6)=5(y-2)$ is

NTA_ABHYAS PAPER-2

Q.1 Let z_1 and z_2 be the n^{th} roots of unity which are ends of a line segment that subtend a right angle at the origin. Then n must be of the form :

(A) 4k + 1 (B) 4k + 2 (C) 4k + 3 (D) 4k

Q.2 In $(0, 2\pi)$, the total number of points where $f(x) = \max.\{\sin x, \cos x, 1 - \cos x\}$ is not differentiable, are equal to :

(A) 3 (B) 4 (C) 5 (D) 6

Q.3 The integral $\int x \cos^{-1}\left(\frac{1-x^2}{1+x^2}\right)dx$; $(x > 0)$ is equal to :

(A) $-x + (1+x^2)\cot^{-1}x + c$ (B) $x - (1 + x^2)\cot^{-1}x + c$

(C) $x - (1+x^2)\tan^{-1}x + c$ (D) $-x + (1 + x^2)\tan^{-1}x + c$

Q.4 The coefficient of x^n in the polynomial $(x + {}^{2n+1}C_0)(x + {}^{2n+1}C_1)(x + {}^{2n+1}C_2$ is) .... $(x + {}^{2n+1}C_n)$

(A) 2^{n+1} (B) $2^{2n+1} - 1$ (C) $2^{2n} - 1$ (D) 2^{2n}

Q.5 The mean of a data set comprising of 16 observations is 16. If one of the observation valued 16 is deleted and three new observations valued 3, 4 and 5 are added to the data, then the mean of the resultant data is :

(A) 14.0 (B) 16.8 (C) 16.0 (D) 15.8

Q.6 The lines represented by the equation $x^2 + 2\sqrt{3}xy + 3y^2 - 3x - 3\sqrt{3}y - 4 = 0$, are

(A) perpendicular to each other (B) parallel

(C) inclined at 45° to each other (D) None of these

Q.7 At present, a firm is manufacturing 2000 items. It is estimated that the rate of change of production P w.r.t. additional number of workers x is given by $\frac{dP}{dx} = 100 - 12\sqrt{x}$. If the firm employs 25 more workers, then the new level of production of item is :

(A) 3500 (B) 4500 (C) 2500 (D) 3000

Q.8 Let $f : R \to R$ be a periodic function such that $f(T + x) = 1 + \left[1 - 3f(x) + 3(f(x))^2 - (f(x))^3\right]^{1/3}$, where T is a fixed positive number, then period of f(x) is :

(A) T (B) 2T (C) 3T (D) None of these

Q.9 AB is a vertical tower. The point A is on the ground and C is the middle point of AB. The part CB subtend an angle α at a point P on the ground. If AP = nAB, then the correct relation is :

(A) $n = (n^2 + 1)\tan\alpha$ (B) $n = (2n^2 - 1)\tan\alpha$ (C) $n^2 = (2n^2 + 1)\tan\alpha$ (D) $n = (2n^2 + 1)\tan\alpha$

Q.10 If $f(x) = \begin{cases} x+1 & ; \quad x>1 \\ 0 & ; \quad x=1 \\ 7-3x & ; \quad x<1 \end{cases}$ then $f'(0)$ equals to :

(A) –1 (B) –2 (C) –3 (D) –4

Q.11 If $x = -1$ and $x = 2$ are points of exterma of $f(x) = \alpha\log|x| + \beta x^2 + x$, then :

(A) $\alpha = 2, \beta = -1/2$ (B) $\alpha = 2, \beta = 1/2$
(C) $\alpha = -6, \beta = 1/2$ (D) $\alpha = -6, \beta = -1/2$

Q.12 If x takes all permissible negative values, then $\sin^{-1}x$ is equal to :

(A) $-\cos^{-1}\sqrt{1-x^2}$ (B) $\cos^{-1}\sqrt{x^2-1}$ (C) $\pi - \cos^{-1}\sqrt{1-x^2}$ (D) $\cos^{-1}\sqrt{1-x^2}$

Q.13 If $f(x) = \prod_{k=1}^{999}(x^2 - 47x + k)$, then product of all real roots of $f(x) = 0$ is :

(A) 550! (B) 551! (C) 552! (D) 999!

Q.14 In a certain town 25% families own a cell phone, 15% families own a scooter and 65% families own neither a cell phone nor a scooter. If 1500 families own both a cell phone and a scooter, then the total number of families in the town is :

(A) 10000 (B) 20000 (C) 30000 (D) 40000

Q.15 The number of ways of arranging 8 men and 4 women around a circular table such that no two women can sit together, is :

(A) 8! (B) 4! (C) 8! 4! (D) $7!\,{}^8P_4$

Q.16 Let $A = \begin{bmatrix} -1 & 2 & -3 \\ -2 & 0 & 3 \\ 3 & -3 & 1 \end{bmatrix}$ be a matrix, then $|A|\text{adj}(A^{-1})$ is equal to :

(A) $O_{3\times 3}$ (B) $\begin{bmatrix} -1 & 2 & -3 \\ -2 & 0 & 3 \\ 3 & -3 & 1 \end{bmatrix}$ (C) I_3 (D) $\begin{bmatrix} -3 & -3 & 1 \\ 3 & 0 & -2 \\ -1 & 2 & -3 \end{bmatrix}$

Q.17 If the equation $x^2 + 4 + 3\sin(ax + b) - 2x = 0$ has atleast one real solution, where $a, b \in [0, 2\pi]$, then one possible value of $(a + b)$ can be equal to :

(A) $\frac{7\pi}{2}$ (B) $\frac{5\pi}{2}$ (C) $\frac{9\pi}{2}$ (D) None of these

Q.18 Fifteen coupons are numbered 1, 2, 3, ..., 15 respectively. Seven coupons are selected at random one at a time with replacement. The probability, that the largest number appearing on selected coupons is at most 9, is :

(A) $\left(\frac{1}{15}\right)^7$ (B) $\left(\frac{3}{5}\right)^7$ (C) $\left(\frac{8}{15}\right)^7$ (D) $\left(\frac{2}{5}\right)^7$

Q.19 For $x \in R,\ x \neq 0$, if $y(x)$ is a differentiable function such that $x\int_1^x y(t)dt = (x+1)\int_1^x ty(t)dt$, then $y(x)$ equals (where C is a constant)

(A) $Cx^3e^{\frac{1}{x}}$ (B) $\frac{C}{x^2}e^{-\frac{1}{x}}$ (C) $\frac{C}{x}e^{-\frac{1}{x}}$ (D) $\frac{C}{x^3}e^{-\frac{1}{x}}$

Q.20 If O is the origin and OP, OQ are distinct tangents to the circle $x^2 + y^2 + 2gx + 2fy + c = 0$, then the circumcentre of the triangle OPQ is :

(A) (–g, –f) (B) (g, f) (C) (–f, –g) (D) None of these

Q.21 The inradius of the triangle having sides 26, 28, 30 units is :

Q.22 Let the sum $\sum_{n=1}^{9}\frac{1}{n(n+1)(n+2)}$, written in the rational form be $\frac{p}{q}$ (where p and q are co-prime), then the value of $\left[\frac{q-p}{10}\right]$ is, (where [.] is the greatest integer function)

Q.23 In a ΔABC, if $\angle A = \angle B = \frac{1}{2}\left(\sin^{-1}\frac{\sqrt{6}+1}{2\sqrt{3}} + \sin^{-1}\left(\frac{1}{\sqrt{3}}\right)\right)$ and length of the side opposite to $\angle C$ is $c = 6.3^{\frac{1}{4}}$, then the area of ΔABC is

Q.24 If $\lim_{x\to 0}\frac{\sin^{-1}x - \tan^{-1}x}{x^3}$ equals L, then the value of (4L + 1) is

Q.25 A farmer F_1 has a land in the shape of a triangle with vertices at P(0,0), Q(1, 1) and R(2, 0). From this land, a neighbouring farmer F_2 takes away the region which lies between the side PQ and a curve of the form $y = x^n$; (n > 1). If the area of the region taken away by the farmer F_2 is exactly 30% of the area of ΔPQR, then the value of n is :

NTA_ABHYAS PAPER-3

Single Choice questions :

Q.1 The probability distribution of a random variable X is given as

(X)	−5	−4	−3	−2	−1	0	1	2	3	4	5
P(X)	p	2p	3p	4p	5p	7p	8p	9p	10p	11p	12p

then, the value of p is :

(A) $\frac{1}{72}$ (B) $\frac{3}{73}$ (C) $\frac{5}{72}$ (D) $\frac{1}{74}$

Q.2 The lengths of two adjacent sides of a cyclic quadrilateral are 2 units and 5 units and the angle between them is 60°. If the area of the quadrilateral is $4\sqrt{3}$ sq. units, then the perimeter of the quadrilateral is :

(A) 12.5 units (B) 13 units (C) 13.2 units (D) 12 units

Q.3 If $f(x) = \cos(\ell nx)$, then $f(x).f(y) - \frac{1}{2}\left[f\left(\frac{x}{y}\right) + f(xy)\right]$ is equal to :

(A) −1 (B) 1/2 (C) −2 (D) 0

Q.4 The coefficient of the term independent of x in $\left[\sqrt{\left(\frac{x}{3}\right)} + \frac{\sqrt{3}}{x^2}\right]^{10}$ is :

(A) $\frac{5}{3}$ (B) $\frac{4}{5}$ (C) 6 (D) $\frac{1}{2}$

Q.5 The area bounded by $y = xe^{|x|}$ and the lines $|x| = 1$, $y = 0$ is :

(A) 4 sq. units (B) 6 sq. units (C) 1 sq. unit (D) 2 sq. units

Q.6 Minimum distance between the curves $y^2 = x - 1$ and $x^2 = y - 1$ is equal to :

(A) $\frac{3\sqrt{2}}{4}$ units (B) $\frac{5\sqrt{2}}{4}$ units (C) $\frac{7\sqrt{2}}{4}$ units (D) $\frac{\sqrt{2}}{4}$ units

Q.7 The integral $\int_{-1/2}^{1/2}\left([x] + \ell n\left(\frac{1+x}{1-x}\right)\right)dx$ is equal to ([x] is the greatest integer ≤ x)

(A) $-\frac{1}{2}$ (B) 1 (C) $2\ell n\left(\frac{1}{2}\right)$ (D) 0

Q.8 How many words, with or without meaning can be made from the letters of the word MONDAY, assuming that no letter is repeated, if 4 letters are used at a time ?

(A) 360 (B) 350 (C) 400 (D) 390

Q.9 If $f(x + y, x - y) = xy$, then the arithmetic mean of $f(x, y)$ and $f(y, x)$ is :

(A) x (B) y (C) 0 (D) $\frac{x^2 - y^2}{2}$

Q.10 The real values of x and y satisfying the equation $\frac{(1+i)x-2i}{3+i}+\frac{(2-3i)y+i}{3-i}=i$ are :

(A) $x = -1, y = 3$ (B) $x = 3, y = -1$ (C) $x = 0, y = 1$ (D) $x = 1, y = 0$

Q.11 Tangent to a curve intersects the y-axis at a point P. A line perpendicular to this tangent through P passes through the point (1, 0). The differential equation of the curve is :

(A) $y\frac{dy}{dx}-x\left(\frac{dy}{dx}\right)^2=1$ (B) $x\frac{d^2y}{dx^2}+\left(\frac{dy}{dx}\right)^2=1$

(C) $y\frac{dx}{dy}+x=1$ (D) None of these

Q.12 If $\Delta_r=\begin{vmatrix}2r-1 & {}^mC_r & 1\\ m^2-1 & 2^m & m+1\\ \sin^2(m^2) & \sin^2 m & \sin^2(m+1)\end{vmatrix}$, then the value of $\sum_{r=0}^{m}\Delta$ is :

(A) 1 (B) 3 (C) 2 (D) 0

Q.13 If $\alpha=\sin^{-1}\frac{\sqrt{3}}{2}+\sin^{-1}\frac{1}{3}$ and $\beta=\cos^{-1}\frac{\sqrt{3}}{2}+\cos^{-1}\frac{1}{3}$, then

(A) $\alpha > \beta$ (B) $\alpha = \beta$ (C) $\alpha < \beta$ (D) $\alpha + \beta = 2\pi$

Q.14 The logically equivalent proposition of $p \Leftrightarrow q$ is :

(A) $(p \wedge q) \vee (p \wedge q)$ (B) $(p \Rightarrow q) \wedge (q \Rightarrow p)$

(C) $(p \wedge q) \vee (q \Rightarrow p)$ (D) $(p \wedge q) \Rightarrow (q \vee p)$

Q.15 If $\log_{10}\left(\frac{x^3-y^3}{x^3+y^3}\right)=2$, then $\frac{dy}{dx}=$

(A) $\frac{x}{y}$ (B) $-\frac{y}{x}$ (C) $-\frac{x}{y}$ (D) $\frac{y}{x}$

Q.16 If A is the set of even natural numbers less than 8 and B is the set of prime numbers less than 7, then the number of relations from A to B are :

(A) 2^9 (B) 9^2 (C) 3^2 (D) 2^{9-1}

Q.17 For real x, the function $\frac{(x-a)(x-b)}{(x-c)}$ will assume all real values provided

(A) $a > b > c$ (B) $a < b < c$ (C) $a > c > b$ (D) $a \le c \le b$

Q.18 OPQR is a square and M, N are the mid points of the sides PQ and QR respectively, then the ratio of the areas of the square and the triangle OMN is :

(A) 4 : 1 (B) 2 : 1 (C) 8 : 3 (D) 7 : 3

Q.19 $\int \frac{\sin^4 x}{\cos^8 x} dx$ is equal to (where C is an arbitrary constant)

(A) $\frac{(1+\tan^5 x)}{5} + \frac{\tan^5 x}{7} + C$ (B) $\frac{\tan^5 x}{5} + \frac{\tan^7 x}{7} + C$

(C) $\frac{\tan^7 x}{5} + \frac{\tan^5 x}{7} + C$ (D) None of these

Q.20 If $x = 3$ is the chord of contact of the circle $x^2 + y^2 = 81$, then the equation of the corresponding pair of tangents, is :

(A) $x^2 - 8y^2 + 54x + 729 = 0$ (B) $x^2 - 8y^2 - 54x + 729 = 0$

(C) $x^2 - 8y^2 - 54x - 729 = 0$ (D) $x^2 - 8y^2 = 729$

Integer questions :

Q.21 The number of solutions, the equation $\sin^4 x + \cos^4 x = \sin x \cos x$ has, in $[\pi, 5\pi]$ is/are

Q.22 A tower subtends angles α, 2α and 3α, respectively, at points A, B and C all lying on a horizontal line through the foot of the tower. If $\frac{AB}{BC} = 1 + p\cos(p\alpha)$, then the value of p is

Q.23 Let $y = \sin^{-1}(\sin 8) - \tan^{-1}(\tan 10)$. If $y + \cos^{-1}(\cos 12) - \sec^{-1}(\sec 9) + \cot^{-1}(\cot 6) - \text{cosec}^{-1}(\text{cosec } 7)$ simplifies to $a\pi + b$, then $(a - b)$ is

Q.24 Let α and β be two numbers where $\alpha < \beta$. The geometric mean of these numbers exceeds the smaller number α by 12 and the arithmetic mean of the same numbers is smaller by 24 than the larger number β, then the value of $|\beta - \alpha|$ is :

Q.25 The value of f(0) so that the function $f(x) = \frac{1-\cos(1-\cos x)}{x^4}$ is continuous everywhere is k, then value of 10k is

NTA ABHYAS PAPER-4

Single Choice

1. The relation "less than" in the set of natural numbers is

(A) only symmetric (B) only transitive

(C) only reflexive (D) an equivalence relation

2. If $I_1 = \int_0^{\pi} \frac{x \sin x}{1+\cos^2 x} dx, I_2 = \int_0^{\pi} x \sin^4 x dx$ then, $I_1 : I_2$ is equal to

(A) 3 : 4 (B) 1 : 2 (C) 4 : 3 (D) 2 : 3

3. Two sides of a triangle are given by the roots of the equation $x^2 - 2\sqrt{3}x + 2 = 0$ and the angle between the sides is $\frac{\pi}{3}$. The perimeter of the triangle is

(A) $2\sqrt{3}$ units (B) $\sqrt{6}$ units (C) $2\sqrt{3} + \sqrt{6}$ units (D) $2\left(\sqrt{3} + \sqrt{6}\right)$ units

4. At an election, a voter may vote for any number of candidates not greater than the number to be elected. There are 10 candidates and 4 are to be elected. If a voter votes for at least one candidate, then the number of ways in which he can vote, is

(A) 6210 (B) 385 (C) 1110 (D) 5040

5. If m is any natural number, then the value of the integral

$\int (x^{3m} + x^{2m} + x^m)(2x^{2m} + 3x^m + 6)^{(1/m)} dx$ is (where, C is an arbitrary constant)

(A) $\frac{1}{6(m+1)}\{2x^{3m} + 3x^{2m} + 6x^m\}^{(1/m)+1} + C$ (B) $\frac{1}{6m}\{2x^{3m} + 3x^{2m} + 6x^m\}^{(1/m)+1} + C$

(C) $\frac{1}{6m}\{2x^{3m} + 3x^{2m} + 6x^m\}^{1/m} + C$ (D) None of the above

6. If 2 (y – a) is the harmonic mean between y – x and y – z, then x – a, y – a and z – a are in

(A) arithmetic progression (B) geometric progression

(C) harmonic progression (D) none of these

7. The number of quadratic equations that are unchanged by squaring their roots is

(A) 2 (B) 4 (C) 6 (D) 8

8. If $\frac{1+3p}{3}, \frac{1-p}{4}$ and $\frac{1-2p}{2}$ are probabilities of mutually exclusive events of a random experiment, then the range of p is

(A) $\frac{1}{3} \le P \le \frac{1}{2}$ (B) $\frac{1}{4} \le P \le \frac{1}{2}$ (C) $\frac{1}{3} \le P \le \frac{2}{3}$ (D) $\frac{1}{3} \le P \le \frac{2}{5}$

9. The function $f(x) = \sec\left[\log\left(x + \sqrt{1+x^2}\right)\right]$ is

(A) an odd function (B) an even function

(C) neither an odd nor an even function (D) a constant function

10. The equation of the bisectors of the angles between the lines represented by the equation $2(x+2)^2 + 3(x+2)(y-2) - 2(y-2)^2 = 0$ is

(A) $3x^2 - 8xy - 3y^2 - 28x + 4y + 32 = 0$ (B) $3x^2 + 8xy - 3y^2 + 28x - 4y + 32 = 0$

(C) $3x^2 - 8xy - 3y^2 + 28x - 4y + 32 = 0$ (D) $3x^2 - 8xy - 3y^2 + 28x - 4y - 32 = 0$

11. Let $\phi(x)$ be the inverse of the function f(x) and $f'(x) = \frac{1}{1+x^5}$ then $\frac{d}{dx}\phi(x)$ is equal to

(A) $\frac{1}{1+[\phi(x)]^5}$ (B) $\frac{1}{1+[f(x)]^5}$ (C) $1 + [\phi(x)]^5$ (D) $1 + f(x)$

12. The possible values of scalar k such that the matrix $A^{-1} - kI$ is singular where $A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 1 & 0 & 0 \end{bmatrix}$, are

(A) $\frac{-1}{2}, 2$ (B) $-1, \frac{1}{2}$ (C) $\frac{1}{2}, \frac{-1}{2}$ (D) $-1, 1$

13. The negation of $p \wedge (q \rightarrow \sim r)$ is

(A) $\sim p \wedge (q \wedge r)$ (B) $p \vee (q \vee r)$ (C) $p \vee (q \wedge r)$ (D) $\sim p \vee (q \wedge r)$

14. If $1 + \sin\theta + \sin^2\theta + \sin^3\theta + \ldots\ldots \infty = 4 + 2\sqrt{3}$, $0 < \theta < \pi$, then

(A) $\theta = \frac{\pi}{3}$ (B) $\theta = \frac{\pi}{6}$ (C) $\theta = \frac{\pi}{3}$ or $\frac{\pi}{6}$ (D) $\theta = \frac{\pi}{3}$ or $\frac{2\pi}{3}$

15. The function $f(x) = \frac{1 - \sin x + \cos x}{1 + \sin x + \cos x}$ is not defined at $x = \pi$. The value of $f(\pi)$, so that f(x) is continuous at $x = \pi$, is

(A) $-\frac{1}{2}$ (B) $\frac{1}{2}$ (C) -1 (D) 1

16. If $f(x) = 3x^4 + 4x^3 - 12x^2 + 12$ then f(x) is

(A) increasing in $(-\infty, -2) \cup (0, 1)$ (B) increasing in $(-2, 0) \cup (1, \infty)$

(C) decreasing in $(-2, 0) \cup (0, 1)$ (D) decreasing in $(-\infty, -2) \cup (1, \infty)$

17. The complete solution set of the inequality $\cos^{-1}(\cos 4) > 3x^2 - 4x$ is

(A) $\left(0, \frac{2+\sqrt{6\pi - 8}}{3}\right)$ (B) $\left(\frac{2-\sqrt{6\pi - 8}}{3}, 0\right)$

(C) (–2, 2) (D) $\left(\frac{2-\sqrt{6\pi-8}}{3}, \frac{2+\sqrt{6\pi-8}}{3}\right)$

18. A ladder 5 m long leans against a vertical wall. The bottom of the ladder is 3 m from the wall. If the bottom of the ladder is pulled 1 m farther from the wall, how much does the top of the ladder slide down the wall

(A) 1 m (B) 4 m (C) 2 m (D) 3 m

19. The area bounded by the curve $y = \frac{1}{2}x^2$, x-axis and x = 2 is

(A) $\frac{1}{3}$ sq. unit (B) $\frac{2}{3}$ sq. unit (C) 1 sq. unit (D) $\frac{4}{3}$ sq. unit

20. If $(1 + x - 2x^2)^6 = 1 + a_1x + a_2x^2 + \ldots\ldots + a_{12}x^{12}$, then the value of $a_2 + a_4 + \ldots.. + a_{12}$ is

(A) 31 (B) 32 (C) 64 (D) 1024

Subjective Numerical

21. $\lim_{x\to 2} \frac{3^x + 3^{3-x} - 12}{3^{-\frac{x}{2}} - 3^{1-x}}$ is equal to

22. Consider a family of circles passing through two fixed points A (3, 7) and B (6, 5). The chord in which the circle $x^2 + y^2 - 4x - 6y - 3 = 0$ cuts each member of family of circles passes through a fixed point (a, b). Then the value of a + 3b is

23. P is a point on the parabola whose ordinate equals its abscissa. A normal is drawn to the parabola at P to meet it again at Q. If S is the focus of the parabola, then the product of slopes of SP and SQ is

24. If $z = \frac{1}{2}\left(\sqrt{3} - i\right)$ and the least positive integral value of n such that $(z^{101} + i^{109})^{106} = z^n$ is k, then the value of $\frac{2}{5}k$ is equal to

25. The angle between the pair of tangents drawn to the ellipse $3x^2 + 2y^2 = 5$ from the point (1, 2) is $\left|\tan^{-1}\left(\frac{12}{\sqrt{\lambda}}\right)\right|$, then the value of λ is

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Single Choice questions :

Q.1 If the value of $(1+\tan 1°)(1+\tan 2°)(1+\tan 3°)......(1+\tan 44°)(1+\tan 45°)$ is 2^{λ}, then the sum of the digits of the number λ is :

(A) 3 (B) 6 (C) 5 (D) 4

Q.2 If $\dfrac{5+9+13+\ldots \text{n terms}}{7+9+11+\ldots (n+1)\text{ terms}}=\dfrac{17}{16}$, then n is equal to :

(A) 7 (B) 12 (C) 8 (D) 15

Q.3 If $2f(xy)=(f(x))^{y}+(f(y))^{x}$ for all $x, y \in R$ and $f(1)=3$, then the value of $\sum_{r=1}^{10} f(r)$ is equal to :

(A) $\dfrac{3}{2}(3^{10}-1)$ (B) $\dfrac{3}{2}(3^{9}-1)$ (C) $\dfrac{3^{10}-1}{2}$ (D) $\dfrac{1}{2}(3^{10}-1)$

Q.4 If $\dfrac{1}{6}\sin\theta, \cos\theta$ and $\tan\theta$ are in geometric progression, then the complete solution set of θ is :

(A) $\left\{\theta : \theta = 2n\pi \pm \left(\dfrac{\pi}{6}\right), n \in I\right\}$ (B) $\left\{\theta : \theta = 2n\pi \pm \left(\dfrac{\pi}{3}\right), n \in I\right\}$

(C) $\left\{\theta : \theta = n\pi + (-1)^{n}\left(\dfrac{\pi}{3}\right), n \in I\right\}$ (D) $\left\{\theta : \theta = n\pi + \dfrac{\pi}{3}, n \in I\right\}$

Q.5 The value of the integral $\int_{0}^{1}\sqrt{\dfrac{1-x}{1+x}}\,dx$ is :

(A) –1 (B) 1 (C) $\dfrac{\pi}{2}-1$ (D) $\dfrac{\pi}{2}+1$

Q.6 If $p, q, r, s > 0$, then $\lim\limits_{x\to\infty}\left(\dfrac{p^{1/x}+q^{1/x}+r^{1/x}+s^{1/x}}{4}\right)^{3x}$ is :

(A) pqrs (B) $(pqrs)^{3}$ (C) $(pqrs)^{3/2}$ (D) $(pqrs)^{3/4}$

Q.7 If $(27)^{999}$ is divided by 7, then the remainder is :

(A) 1 (B) 2 (C) 3 (D) 6

Q.8 If $A = \begin{bmatrix} 1 & -3 \\ 2 & k \end{bmatrix}$ and $A^2 - 4A + 10I = A$, then k is equal to :

(A) 0 (B) –4 (C) 4 (D) 1 or 4

Q.9 A piece of cheese is located at (12, 10) in a coordinate plane. A mouse is at (4, –2) and is running up the line $y = -5x + 18$ to get closer to the piece of cheese. At the point (a, b), the mouse starts getting farther from the cheese rather than closer to it. Then the value of (a + b) is :

(A) 6 (B) 10 (C) 18 (D) 14

Q.10 Two medians drawn from the acute angles vertices of a right angled triangle intersects at an angle $\frac{\pi}{6}$. If the length of the hypotenuse of the triangle is 3 units, then area of the triangle (in sq. units) is:

(A) $\sqrt{3}$ (B) 3 (C) $\sqrt{2}$ (D) 9

Q.11 If z is a non-real complex number, then the minimum value of $\frac{\text{Im}\, z^5}{(\text{Im}\, z)^5}$ is (Im z = Imaginary part of z)

(A) –2 (B) –4 (C) –5 (D) –1

Q.12 If the coefficient of x^7 in $\left(ax^2 + \frac{1}{bx}\right)^{11}$ is equal to the coefficient of x^{-7} in $\left(ax - \frac{1}{bx^2}\right)^{11}$, then a and b satisfy the relation :

(A) ab = 1 (B) $\frac{a}{b} = 1$ (C) a + b = 1 (D) a – b = 1

Q.13 The average of five consecutive odd numbers is 61. Then the difference between the highest and lowest numbers is :

(A) 2 (B) 5 (C) 8 (D) Cannot be determined

Q.14 The abscissa of A and B are the roots of the equation $x^2 + 2ax - b^2 = 0$ and their ordinates are the roots of the equation $y^2 + 2py - q^2 = 0$. The equation of the circle with AB as diameter is :

(A) $x^2 + y^2 + 2ax + 2py - b^2 - q^2 = 0$
(B) $x^2 + y^2 + 2ax + py - b^2 - q^2 = 0$
(C) $x^2 + y^2 + 2ax + 2py + b^2 + q^2 = 0$
(D) None of these

Q.15 A tower T_1 of height 60 m is located exactly opposite to a tower T_2 of height 80 m on a straight road. From the top of T_1, if the angle of depression of the foot of T_2 is twice the angle of elevation of the top of T_2, then the width (in m) of the road between the feet of the towers T_1 and T_2 is :

(A) $20\sqrt{2}$ (B) $10\sqrt{2}$ (C) $10\sqrt{3}$ (D) $20\sqrt{3}$

Q.16 The area between the curve $y = 2x^4 - x^2$, the x-axis and the ordinates of the two minima of the curve is

(A) $\frac{11}{60}$ sq. units (B) $\frac{7}{120}$ sq. units (C) $\frac{1}{30}$ sq. units (D) $\frac{7}{90}$ sq. units

Q.17 If for a plane, x, y, z intercepts are 8, 4, 4 respectively, then the length of the perpendicular from the origin on to the plane is :

(A) $\frac{8}{3}$ units (B) $\frac{3}{8}$ units (C) 3 units (D) $\frac{4}{5}$ units

Q.18 If $f(x) = \begin{cases} \frac{\sqrt{4+ax} - \sqrt{4-ax}}{x}, & -1 \le x < 0 \\ \frac{3x+2}{x-8}, & 0 \le x \le 1 \end{cases}$ is continuous in $[-1, 1]$, then the value of a is :

(A) 1 (B) -1 (C) $\frac{1}{2}$ (D) $-\frac{1}{2}$

Q.19 The relation R is defined in the set $\{1, 2, 3, 4, 5, 6\}$ as $R = \{(a, b) : b = a + 1\}$, then

(A) R is neither reflexive nor symmetric nor transitive

(B) R is neither reflexive nor symmetric but transitive

(C) R is not reflexive but symmetric and transitive

(D) R is reflexive, symmetric and transitive

Q.20 $\int \frac{\sin^8 x - \cos^8 x}{1 - 2\sin^2 x \cos^2 x} dx$ is equal to (where C is an arbitrary constant)

(A) $\frac{1}{2}\sin 2x + C$ (B) $-\frac{1}{2}\sin 2x + C$ (C) $-\frac{1}{2}\sin x + C$ (D) $-\sin^2 x + C$

Integer questions :

Q.21 Let $P(x) = x^2 + bx + c$, where b and c are integers. If P(x) is a factor of both $x^4 + 6x^2 + 25$ and $3x^4 + 4x^2 + 28x + 5$, then the value of P(1) is ?

Q.22 There are eight rooms on the first floor of a hotel, with four rooms on each side of the corridor, symmetrically situated (that is each room is exactly opposite to one other room). Four guests have to be accommodated in four of the eight rooms (that is, one in each) such that no two guests are in adjacent rooms or in opposite rooms. If N is the number of ways in which guests can be accommodated. Then the value of $\frac{N}{6}$ is

Q.23 Let $f[1, \infty) \to [2, \infty)$ be a differentiable function such that $f(1) = \frac{1}{3}$. If $6\int_1^x f(t)\,dt = 3xf(x) - x^3$ for all $x \geq 1$, then the value of 3f(2) is

Q.24 If $y = \tan^{-1}(\sec x - \tan x)$, then the value of $\frac{dy}{dx}$ is :

Q.25 The volume of a cube is increasing at the rate of 18 cm^3 per second. When the edge of the cube is12 cm, then the rate in cm^2/s at which the surface area of the cube increases, is

NTA ABHYAS PAPER -6

Single Choice

1. sin ax + cos ax and |sin x| + |cos x| are periodic with the same fundamental period. If a equals to

(A) 0 (B) 1 (C) 2 (D) 4

2. The differential coefficient of $\log_{10} x$ with respect to $\log_x 10$ is

(A) 1 (B) $-(\log_{10} x)^2$ (C) $(\log_x 10)^2$ (D) $\frac{x^2}{100}$

3. If A, B, C are the angles of a triangle and $\begin{vmatrix} 1 & 1 & 1 \\ 1+\sin A & 1+\sin B & 1+\sin C \\ \sin A+\sin^2 A & \sin B+\sin^2 B & \sin C+\sin^2 C \end{vmatrix}=0$

then triangle ABC is

(A) right angled isosceles (B) isosceles

(C) equilateral (D) scalene

4. The contrapositive of the statement "If two triangles are identical, then they are similar" is

(A) If two triangles are not similar, then they are not identical

(B) If two triangles are not identical, then they are not similar

(C) If two triangles are not identical, then they are similar

(D) If two triangles are not similar, then they are identical

5. If $f(x) = a - (x - 3)^{8/9}$, then the maximum value of f(x) is

(A) 3 (B) a – 3 (C) a (D) None of these

6. The value of $\sin(\cot^{-1} x)$ is

(A) $\sqrt{1+x^2}$ (B) x (C) $\frac{1}{\sqrt{1+x^2}}$ (D) $\sqrt{1-x^2}$

7. The area bounded by the curves $y = x^2$ and $y=\frac{2}{(1+x^2)}$ is

(A) $\left(\pi-\frac{1}{3}\right)$ sq.units (B) $\left(\pi-\frac{2}{3}\right)$ sq.units (C) $\frac{(2\pi-1)}{3}$ sq.units (D) None of these

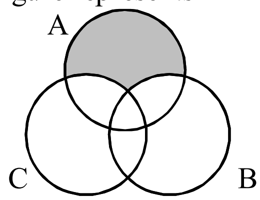
8. The value of $\lim_{x\to 0}\frac{x^{6000}-(\sin x)^{6000}}{x^2(\sin x)^{6000}}$ is

(A) 1000 (B) 100 (C) 1100 (D) 1010

9. The value of the integral $\int_4^{10}\frac{[x^2]}{[x^2-28x+196]+[x^2]}dx$, where [x] denotes the greatest integer less than or equal to x, is

(A) $\frac{1}{3}$ (B) 6 (C) 7 (D) 3

10. The shaded region in the given figure represents



(A) $A \cap (B \cup C)$ (B) $A \cup (B \cap C)$ (C) $A \cap (B - C)$ (D) $A - (B \cup C)$

11. If $a\sin^2 x + b\cos^2 x = c$, $b\sin^2 y + a\cos^2 y = d$ and $a \tan x = b \tan y$, then $\frac{a^2}{b^2}$ is equal to (Here a, b, c and d are distinct)

(A) $\frac{(b-c)(d-b)}{(a-d)(a-b)}$ (B) $\frac{(a-d)(c-a)}{(b-c)(d-b)}$ (C) $\frac{(d-a)(c-a)}{(b-c)(d-b)}$ (D) $\frac{(b-c)(b-d)}{(a-c)(a-d)}$

12. Number of points from where perpendicular tangents to the curve $\frac{x^2}{16} - \frac{y^2}{25} = 1$ can be drawn, is/are

(A) 1 (B) 2 (C) 0 (D) infinite

13. The sum of the first 20 terms common between the series 3 + 7 + 11 + 15 + ……. and 1 + 6 + 11 + 16 + …… is

(A) 4000 (B) 4200 (C) 4220 (D) 4020

14. Let 10 vertical poles standing at equal distances on a straight line, subtend the same angle of elevation α at a point O on this line and all the poles are on the same side of O. If the height of the longest pole is h and the distance of the foot of the smallest pole from O is α; then the distance between two consecutive poles, is

(A) $\frac{h\sin\alpha + a\cos\alpha}{9\cos\alpha}$ (B) $\frac{h\cos\alpha - a\sin\alpha}{9\sin\alpha}$ (C) $\frac{h\sin\alpha + a\cos\alpha}{9\sin\alpha}$ (D) $\frac{h\cos\alpha - a\sin\alpha}{9\cos\alpha}$

15. Let $\vec{u}, \vec{v}$ and $\vec{w}$ are vectors such that $\vec{u} + \vec{v} + \vec{w} = \vec{0}$. If $|\vec{u}| = 3, |\vec{v}| = 4$ and $|\vec{w}| = 5$, then the value of $\vec{u}\cdot\vec{v} + \vec{v}\cdot\vec{w} + \vec{w}\cdot\vec{u}$ is

(A) –25 (B) –27 (C) 28 (D) 25

16. The total number of ways in which 5 balls of different colours can be distributed among 3 persons such that each person gets at least one ball is

(A) 75 (B) 150 (C) 210 (D) 243

17. The order of the differential equation whose general solution is given by $y = (c_1 + c_2)\cos(x + c_3) - c_4 e^{x+c_5}$ where c_1, c_2, c_3, c_4 & c_5 are arbitrary constant, is

(A) 5 (B) 4 (C) 3 (D) 2

18. In a test, an examinee either guesses or copies or knows the answer to a multiple choice question with four choices. The probability that he makes a guess is $\frac{1}{3}$ and the probability that he copies the answer is $\frac{1}{6}$. The probability that his answer is correct given that he copies it is $\frac{1}{8}$. The probability that his answer is correct, given that he guesses it is $\frac{1}{4}$. The probability that he knew the answer to the question given that he correctly answered, is

(A) $\frac{24}{31}$ (B) $\frac{17}{24}$ (C) $\frac{24}{29}$ (D) $\frac{29}{31}$

19. The number of values of $\theta \in \left[\frac{-3\pi}{2}, \frac{4\pi}{3}\right]$ which satisfies the system of equations $2\sin^2\theta + \sin^2 2\theta = 2$ and $\sin 2\theta + \cos 2\theta = \tan\theta$ is

(A) 2 (B) 4 (C) 6 (D) 8

20. If the three distinct lines $x + 2ay + a = 0$, $x + 3by + b = 0$ and $x + 4ay + a = 0$ are concurrent, then the point (a, b) lies on a

(A) circle (B) straight line (C) parabola (D) hyperbola

Subjective Numerical

21. If the line $y - 2 = 0$ is the directrix of the parabola $x^2 - ky + 32 = 0$, $k \neq 0$ and the parabola intersects the circle $x^2 + y^2 = 8$ at two real distinct points, then the absolute value of k is

22. If z_1, z_2 and z_3 are three complex numbers such that $|z_1| = |z_2| = |z_3| = \left|\frac{1}{z_1} + \frac{1}{z_2} + \frac{1}{z_3}\right| = 1$, then $|z_1 + z_2 + z_3|$ is

23. If the 4th term in the expansion of $\left(\sqrt{x^{\frac{1}{\log_{10} x + 1}}} + x^{\frac{1}{12}}\right)^6$ is 200, then the value of x is (where, x > 1)

24. If $\int \frac{dx}{\sqrt{x} + \sqrt[3]{x}} = a\sqrt{x} + b\left(\sqrt[3]{x}\right) + c\left(\sqrt[6]{x}\right) + d\ln\left(\sqrt[6]{x} + 1\right) + e$, e being an arbitrary constant, then the value of 20a + b + c + d is

25. Given $f(x) = \begin{cases} x^2 e^{2(x-1)}, 0 \le x \le 1. \\ a\,\text{sgn}(x+1)\cos(2x-2) + bx^2, 1 < x \le 2 \end{cases}$. If f(x) is differentiable at x = 1, then the value of |a – b| is

NTA ABHYAS PAPER - 7

Single Choice

1. The length of the shadows of a vertical pole of height h, thrown by the sun's rays at three different moments are h, 2h and 3h. The sum of the angles of elevation of the rays at these three moments is equal to

(A) $\frac{\pi}{2}$ (B) $\frac{\pi}{3}$ (C) $\frac{\pi}{4}$ (D) $\frac{\pi}{6}$

2. The function f: R → R is defined as $f(x) = 3^{-x}$. From the following statements,

(I) f is one-one

(II) f is onto

(II) f is a decreasing function

the true statements are

(A) only I, II (B) only II, III (C) only I, III (D) I, II, III

3. If $f(x) = \begin{cases} x^p \cos\left(\frac{1}{x}\right), x \neq 0 \\ 0, \quad x = 0 \end{cases}$ is differentiable at x = 0, then

(A) p < 0 (B) 0 < p < 1 (C) p = 1 (D) p > 1

4. If p : A man is happy and q : A man is rich are two statements, then the statement. "If a man is not happy, then he is not rich" can be written using logical operators as

(A) $\sim p \to \sim q$ (B) $\sim q \to p$ (C) $\sim q \to \sim p$ (D) $q \to \sim p$

5. The general solution of the system of equations $\sin^3 x + \sin^3\left(\frac{2\pi}{3} + x\right) + \sin^3\left(\frac{4\pi}{3} + x\right)$ and $+\frac{3}{4}\cos 2x = 0$ $\cos x \neq 0$

(A) $x = \frac{(2k+1)\pi}{10}, k \in Z$ (B) $x = \frac{(2k+1)\pi}{5}, k \in Z$

(C) $x = \frac{(4k+1)\pi}{10}, k \in Z$ (D) $x = \left(\frac{4k+1}{5}\right)\pi, k \in Z$

6. If $a + b + c > \frac{9c}{4}$ and the equation $ax^2 + 2bx - 5c = 0$ has non-real complex roots, then

(A) a > 0, c > 0 (B) a > 0, c < 0 (C) a < 0, c < 0 (D) a < 0, c > 0

7. If $\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} = 5$, then the value of $\begin{vmatrix} b_2c_3 - b_3c_2 & a_3c_2 - a_2c_3 & a_2b_3 - a_3b_2 \\ b_3c_1 - b_1c_3 & a_1c_3 - a_3c_1 & a_3b_1 - a_1b_3 \\ b_1c_2 - b_2c_1 & a_2c_1 - a_1c_2 & a_1b_2 - a_2b_1 \end{vmatrix}$ is

(A) 5 (B) 25 (C) 125 (D) 0

8. The function $f(x) = \dfrac{x}{1+|x|}$ is

(A) strictly increasing (B) strictly decreasing

(C) neither increasing nor decreasing (D) not differentiable at x = 0

9. If $z \neq I$ be any complex number such that $\dfrac{z-i}{z+i}$ is a purely imaginary number, then, $z + \dfrac{1}{z}$ is

(A) any non-zero real number other than 1 (B) a purely imaginary number

(C) 0 (D) any non-zero real number

10. The domain set of the function $f(x) = \tan^{-1} x - \cot^{-1} x + \cos^{-1}(2 - x)$ is

(A) [0, 1] (B) [–1, 1] (C) [1, 3] (D) None of these

11. The distance of the point (1, 2, 3) from the plane x + y – z = 5 measured along the straight line x = y = z is

(A) $5\sqrt{3}$ units (B) $10\sqrt{3}$ units (C) $3\sqrt{3}$ units (D) $3\sqrt{5}$ units

12. The number of rational point(s) (a point (a, b) is rational, if a and b both are rational numbers) on the circumference of a circle having centre (π, e) is

(A) at most one (B) at least two (C) exactly two (D) infinite

13. If the integral $\int \dfrac{5\tan x}{\tan x - 2}dx = x + a\log|\sin x - 2\cos x| + k$, then the value of a is

(A) 1 (B) 2 (C) –1 (D) –2

14. If $\vec{a}, \vec{b}, \vec{c}$ are non coplanar non-zero vectors such that $\vec{b} \times \vec{c} = \vec{a}, \vec{a} \times \vec{b} = \vec{c}$ and $\vec{c} \times \vec{a} = \vec{b}$, then which of the following is not true

(A) $|\vec{a}| = 1$ (B) $\left[\vec{a}\ \vec{b}\ \vec{c}\right] = 1$ (C) $|\vec{a}| + |\vec{b}| + |\vec{c}| = 3$ (D) $|\vec{a}| \neq |\vec{b}| \neq |\vec{c}|$

15. The value of $\lim\limits_{x \to 0} \dfrac{\log(1+x+x^2) + \log(1-x+x^2)}{\sec x - \cos x}$ is equal to

(A) –1 (B) 1 (C) 0 (D) 2

16. If $\begin{vmatrix} (a+\lambda)^2 & (b+\lambda)^2 & (c+\lambda)^2 \\ (a-\lambda)^2 & (b-\lambda)^2 & (c-\lambda)^2 \end{vmatrix}$ then k is equal $= k\lambda \begin{vmatrix} a^2 & b^2 & c^2 \\ a & b & c \\ 1 & 1 & 1 \end{vmatrix}, \lambda \neq 0$ to :

(A) $4\lambda abc$ (B) $-4\lambda^2$ (C) $4\lambda^2$ (D) $-4\lambda abc$

17. The line 3x – 4y + 7 = 0 is rotated through an angle $\frac{\pi}{4}$ in the clockwise direction about the point (–1, 1). The equation of the line in its new position is

(A) 7y + x – 6 = 0 (B) 7y – x – 6 = 0 (C) 7y + x + 6 = 0 (D) 7y – x + 6 = 0

18. If $2y = \left(\cot^{-1}\left(\frac{\sqrt{3}\cos x + \sin x}{\cos x - \sqrt{3}\sin x}\right)\right)^2 \forall x \in \left(0, \frac{\pi}{2}\right)$ then $\frac{dy}{dx}$ is equal to

(A) $\frac{\pi}{6} - x$ (B) $2x - \frac{\pi}{3}$ (C) $x - \frac{\pi}{6}$ (D) $\frac{\pi}{3} - x$

19. An experiment yields 3 mutually exclusive and exhaustive events A, B and C. If P(A) – 2P(B) = 3P(C), the P(A) is equal to

(A) $\frac{1}{11}$ (B) $\frac{2}{11}$ (C) $\frac{3}{11}$ (D) $\frac{6}{11}$

20. The number of four-digit numbers formed by using the digits 0, 2, 4, 5 and which are not divisible by 5, is

(A) 10 (B) 8 (C) 6 (D) 4

Subjective Numerical

21. If the variance of the following data :

6, 8, 10, 12, 14, 16, 18, 20, 22, 24 is K, then the value of $\frac{K}{11}$ is

22. If the middle term in the binomial expansion of $\left(\frac{1}{x} + x\sin x\right)^{10}$ is $\frac{63}{8}$, then the value of $6\sin^2 x + \sin x - 2$ is

23. The area enclosed between the curves $y = ax^2$ and $x = ay^2$ (a > 0) is 1 sq. unit. If the value of a is $\frac{3\sqrt{3}}{\lambda}$, then the value of λ is

24. The value of $\left[\int_{-\pi}^{\pi} \sqrt{\frac{|\sin y|}{1+\tan^2 y}}dy\right]$ (where [x] is greatest integer function) is

25. Let a_1 , a_2, a_3 ……..., a_{11} be real numbers satisfying a_1 = 15, 27 – $2a_2$ > 0 and $a_k = 2a_{k-1} - a_{k-2}$ $\forall$ k = 3, 4, ……., 11. If $\frac{a_1^2 + a_2^2 + ... + a_{11}^2}{11} = 90$, then the value of $\frac{a_1 + a_2 + ... + a_{11}}{11}$ is equal to

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Single Choice questions :

Q.1 A number x is chosen at random from the set $\{1, 2, 3, 4, \ldots, 100\}$. Define the event : A = the chosen number x satisfies $\frac{(x-10)(x-50)}{(x-30)} \geq 0$, then P(A) is :

(A) 0.20 (B) 0.51 (C) 0.71 (D) 0.70

Q.2 The lock of a safe consists of five discs each of which features the digits 0, 1, 2,...., 9. the safe can be opened by dialing a special combination of the digits. If the work day lasts 13 hours and to dial one combination of digits takes 5 seconds, then number of days sufficient enough to open the safe, are :

(A) 9 (B) 10 (C) 11 (D) 12

Q.3 If the line $x - 2y = 12$ is a tangent to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ at the point $\left(3, -\frac{9}{2}\right)$, then the length of the latus rectum of the ellipse is :

(A) 5 units (B) $12\sqrt{2}$ units (C) 9 units (D) $8\sqrt{3}$ units

Q.4 The geometric mean of 6 observations was calculated as 13. It was later observed that one of the observations was recorded as 28 instead of 36. The correct geometric mean is :

(A) $\left(\frac{9}{7}\right)^{1/6}$ (B) $3\left(\frac{9}{7}\right)^{1/6}$ (C) $13\left(\frac{9}{7}\right)^{1/6}$ (D) $13\left(\frac{7}{9}\right)^{1/6}$

Q.5 Let $y = x^{x^{x \ldots \infty}}$, then $\frac{dy}{dx}$ is equal to (given $x > 0$)

(A) yx^{y-1} (B) $\frac{y^2}{x(1 - y\ln x)}$ (C) $\frac{y}{x(1 + y\ln x)}$ (D) None of these

Q.6 If $f(x) = 2x - \sin x$, $f ; R \to R$ and $g(x) = x^{1/3}$, $g : R \to R$ then

(A) both f and g are onto (B) gof is one-one

(C) both f and g are one-one (D) All are true

Q.7 General solution of the equation $\tan^2\theta + \sec 2\theta = 1$ is :

(A) $m\pi, n\pi + \frac{\pi}{3}, m \in I, n \in I$ (B) $m\pi, n\pi \pm \frac{\pi}{3}, m \in I, n \in I$

(C) $m\pi, n\pi + \frac{\pi}{6}, m \in I, n \in I$ (D) None of these

Q.8 $2^n < n!$ is true for {where $n \in N$}

(A) $n < 4$ (B) $n \geq 4$ (C) $n < 3$ (D) None of these

Q.9 The relation $\tan^{-1}\left(\frac{1+x}{1-x}\right) = \frac{\pi}{4} + \tan^{-1}x$ holds true for all :

(A) $x \in R$ (B) $x \in (-\infty, 1)$ (C) $x \in (-1, \infty)$ (D) $x \in (-\infty, 2)$

Q.10 Line L has intercepts a and b on the coordinate axes, when the axes are rotated through a given angle keeping the origin fixed, the same line has intercepts p and q, then :

(A) $a^2 + b^2 = p^2 + q^2$ (B) $\frac{1}{a^2} + \frac{1}{b^2} = \frac{1}{p^2} + \frac{1}{q^2}$

(C) $a^2 + p^2 = b^2 + q^2$ (D) $\frac{1}{a^2} + \frac{1}{p^2} = \frac{1}{b^2} + \frac{1}{q^2}$

Q.11 A chimney of 20 m height standing on the top of a building subtends an angle whose tangent is $\frac{1}{6}$ at a distance of 70 m from the foot of the building, then the height of building is :

(A) 50 m (B) 25 m (C) 75 m (D) 100 m

Q.12 The value of the integral $\int_{-a}^{a} \frac{e^x}{1+e^x}dx$ is :

(A) e^{a2} (B) a (C) e^{-a^2} (D) $\frac{a}{2}$

Q.13 The function $x^5 - 5x^4 + 5x^3 - 1$ is :

(A) maximum at x = 3 and minimum at x = 1

(B) minimum at x = 1

(C) neither maximum nor minimum at x = 0

(D) maximum at x = 0

Q.14 The order and degree of the differential equation $\frac{d^2y}{dx^2} = \left[y + \left(\frac{dy}{dx}\right)^6\right]^{1/4}$ are :

(A) 2, 4 (B) 3, 4 (C) 2, 5 (D) 2, 6

Q.15 A and B are two matrices such that the order of A is 3 × 4, if A' B and BA' are both defined, then :

(A) order of B' is 3 × 4 (B) order of B'A is 4 × 4

(C) order of B'A is 3 × 3 (D) B'A is not defined

Q.16 If $A = \{x : x^2 - 5x + 6 = 0\}$, $B = \{2, 4\}$, $C = \{4, 5\}$, then $A \times (B \cap C)$ is :

(A) $\{(2, 4), (3, 4)\}$ (B) $\{(4, 2), (4, 3)\}$

(C) $\{(2, 4), (3, 4), (4, 4)\}$ (D) $\{(2, 2), (3, 3), (4, 4), (5, 5)\}$

Q.17 The variance of the numbers 2, 3, 11 and x is $\frac{49}{4}$, then the values of x are :

(A) 6 or $\frac{14}{3}$ (B) 6 or $\frac{14}{5}$ (C) 6 or $\frac{16}{3}$ (D) 4 or $\frac{13}{5}$

Q.18 If n is an even positive integer greater than 1 and $x > 0$, then the condition that the greatest term in the expansion of $(1 + x)^n$ may have the greatest coefficient also is :

(A) $\frac{n-1}{n} < x < \frac{n}{n-1}$ (B) $\frac{n}{n+1} < x < \frac{n+1}{n}$

(C) $\frac{n}{n+3} < x < \frac{n+3}{n}$ (D) $\frac{n}{n+2} < x < \frac{n+2}{n}$

Q.19 If $f(x) = \begin{cases} \frac{\sqrt{g(x)}-1}{\sqrt{x}-1}; & x \neq 1 \\ 1; & x = 1 \end{cases}$ and $g'(1) = 2$, $g(1) = 1$, then $\lim_{x \to 1} f(x)$ is equal to :

(A) 1 (B) 3 (C) 2 (D) 4

Q.20 Let two numbers have an arithmetic mean 9 and geometric mean 4, then these numbers are the roots of the quadratic equation :

(A) $x^2 + 18x - 16 = 0$ (B) $x^2 - 18x + 16 = 0$

(C) $x^2 + 18x + 16 = 0$ (D) $x^2 - 18x - 16 = 0$

Integer questions :

Q.21 If two points P and Q are on the curve $y = 2^{x+2}$, such that $\overrightarrow{OP} \cdot \hat{i} = -1$ and $\overrightarrow{OQ} \cdot \hat{i} = 2$, where $\hat{i}$ is a unit vector along the x-axis, then $\left|\overrightarrow{OQ} - 4\overrightarrow{OP}\right|$ is equal to ?

Q.22 Let f, g and h are differentiable functions. If $f(0) = 1$; $g(0) = 2$; $h(0) = 3$ and the derivatives of their pair wise products at $x = 0$ are $(fg)'(0) = 6$; $(gh)'(0) = 4$ and $(hf)'(0) = 5$, then the value of $(fgh)'(0)$ is ?

Q.23 If $iz^3 + z^2 - z + i = 0$, then $|z|$ is equal to ?

Q.24 The graph $g(x)$ of the antiderivative of $f(x) = xe^{x/2}$ passes through (0, 3), then the value of $g(2) - f(0)$ is ?

Q.25 The positive value of parameter a for which the area bounded by parabolas $y = x - ax^2$ and $ay = x^2$ attains the maximum value is ?

NTA ABHYAS PAPER - 9

Single Choice

1. The length of the shadows of a vertical pole of height h, thrown by the sun's rays at three different moments are h, 2h and 3h. The sum of the angles of elevation of the rays at these three moments is equal to

(A) $\frac{\pi}{2}$ (B) $\frac{\pi}{3}$ (C) $\frac{\pi}{4}$ (D) $\frac{\pi}{6}$

2. The function f: R → R is defined as $f(x) = 3^{-x}$. From the following statements,

(I) f is one-one

(II) f is onto

(II) f is a decreasing function

the true statements are

(A) only I, II (B) only II, III (C) only I, III (D) I, II, III

3. If $f(x)=\begin{cases} x^p\cos\left(\frac{1}{x}\right), & x\neq 0 \\ 0, & x=0 \end{cases}$ is differentiable at x = 0, then

(A) $p < 0$ (B) $0 < p < 1$ (C) $p = 1$ (D) $p > 1$

4. If p : A man is happy and q : A man is rich are two statements, then the statement. "If a man is not happy, then he is not rich" can be written using logical operators as

(A) $\sim p \rightarrow \sim q$ (B) $\sim q \rightarrow p$ (C) $\sim q \rightarrow \sim p$ (D) $q \rightarrow \sim p$

5. The general solution of the system of equations $\sin^3 x+\sin^3\left(\frac{2\pi}{3}+x\right)+\sin^3\left(\frac{4\pi}{3}+x\right)$ and $+\frac{3}{4}\cos 2x=0$ $\cos x \neq 0$ is

(A) $x=\frac{(2k+1)\pi}{10}, k\in Z$ (B) $x=\frac{(2k+1)\pi}{5}, k\in Z$

(C) $x=\frac{(4k+1)\pi}{10}, k\in Z$ (D) $x=\left(\frac{4k+1}{5}\right)\pi, k\in Z$

6. If $a+b+c>\frac{9c}{4}$ and the equation $ax^2 + 2bx - 5c = 0$ has non-real complex roots, then

(A) $a > 0, c > 0$ (B) $a > 0, c < 0$ (C) $a < 0, c < 0$ (D) $a < 0, c > 0$

7. If $\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} = 5$, then the value of $\begin{vmatrix} b_2c_3 - b_3c_2 & a_3c_2 - a_2c_3 & a_2b_3 - a_3b_2 \\ b_3c_1 - b_1c_3 & a_1c_3 - a_3c_1 & a_3b_1 - a_1b_3 \\ b_1c_2 - b_2c_1 & a_2c_1 - a_1c_2 & a_1b_2 - a_2b_1 \end{vmatrix}$ is

(A) 5 (B) 25 (C) 125 (D) 0

8. The function $f(x) = \frac{x}{1+|x|}$ is

(A) strictly increasing (B) strictly decreasing

(C) neither increasing nor decreasing (D) not differentiable at x = 0

9. If $z \neq i$ be any complex number such that $\frac{z-i}{z+i}$ is a purely imaginary number, then, $z + \frac{1}{z}$ is

(A) any non-zero real number other than 1 (B) a purely imaginary number

(C) 0 (D) any non-zero real number

10. The domain set of the function $f(x) = \tan^{-1} x - \cot^{-1} x + \cos^{-1}(2 - x)$ is

(A) [0, 1] (B) [–1, 1] (C) [1, 3] (D) None of these

11. The distance of the point (1, 2, 3) from the plane x + y – z = 5 measured along the straight line x = y = z is

(A) $5\sqrt{3}$ units (B) $10\sqrt{3}$ units (C) $3\sqrt{3}$ units (D) $3\sqrt{5}$ units

12. The number of rational point(s) (a point (a, b) is rational, if a and b both are rational numbers) on the circumference of a circle having centre (π, e) is

(A) at most one (B) at least two (C) exactly two (D) infinite

13. If the integral $\int \frac{5\tan x}{\tan x - 2} dx = x + a\log|\sin x - 2\cos x| + k$, then the value of a is

(A) 1 (B) 2 (C) –1 (D) –2

14. If $\vec{a}, \vec{b}, \vec{c}$ are non coplanar non-zero vectors such that $\vec{b} \times \vec{c} = \vec{a}, \vec{a} \times \vec{b} = \vec{c}$ and $\vec{c} \times \vec{a} = \vec{b}$, then which of the following is not true

(A) $|\vec{a}| = 1$ (B) $[\vec{a}\ \vec{b}\ \vec{c}] = 1$ (C) $|\vec{a}| + |\vec{b}| + |\vec{c}| = 3$ (D) $|\vec{a}| \neq |\vec{b}| \neq |\vec{c}|$

15. The value of $\lim_{x\to 0} \frac{\log(1+x+x^2) + \log(1-x+x^2)}{\sec x - \cos x}$ is equal to

(A) –1 (B) 1 (C) 0 (D) 2

16. If $\begin{vmatrix} a^2 & b^2 & c^2 \\ (a+\lambda)^2 & (b+\lambda)^2 & (c+\lambda)^2 \\ (a-\lambda)^2 & (b-\lambda)^2 & (c-\lambda)^2 \end{vmatrix}$ then k is equal $= k\lambda \begin{vmatrix} a^2 & b^2 & c^2 \\ a & b & c \\ 1 & 1 & 1 \end{vmatrix}, \lambda \neq 0$ to :

(A) $4\lambda abc$ (B) $-4\lambda^2$ (C) $4\lambda^2$ (D) $-4\lambda abc$

17. The line 3x – 4y + 7 = 0 is rotated through an angle $\frac{\pi}{4}$ in the clockwise direction about the point (–1, 1). The equation of the line in its new position is

(A) 7y + x – 6 = 0 (B) 7y – x – 6 = 0 (C) 7y + x + 6 = 0 (D) 7y – x + 6 = 0

18. If $2y = \left(\cot^{-1}\left(\frac{\sqrt{3}\cos x + \sin x}{\cos x - \sqrt{3}\sin x}\right)\right)^2 \forall x \in \left(0, \frac{\pi}{2}\right)$ then $\frac{dy}{dx}$ is equal to

(A) $\frac{\pi}{6} - x$ (B) $2x - \frac{\pi}{3}$ (C) $x - \frac{\pi}{6}$ (D) $\frac{\pi}{3} - x$

19. An experiment yields 3 mutually exclusive and exhaustive events A, B and C. If P(A) = 2P(B) = 3P(C), the P(A) is equal to

(A) $\frac{1}{11}$ (B) $\frac{2}{11}$ (C) $\frac{3}{11}$ (D) $\frac{6}{11}$

20. The number of four-digit numbers formed by using the digits 0, 2, 4, 5 and which are not divisible by 5, is

(A) 10 (B) 8 (C) 6 (D) 4

Subjective Numerical

21. If the variance of the following data :

6, 8, 10, 12, 14, 16, 18, 20, 22, 24 is K, then the value of $\frac{K}{11}$ is

22. If the middle term in the binomial expansion of $\left(\frac{1}{x} + x\sin x\right)^{10}$ is $\frac{63}{8}$, then the value of $6\sin^2 x + \sin x - 2$ is

23. The area enclosed between the curves $y = ax^2$ and $x = ay^2$ (a > 0) is 1 sq. unit. If the value of a is $\frac{3\sqrt{3}}{\lambda}$, then the value of λ is

24. The value of $\left[\int_{-\pi}^{\pi} \sqrt{\frac{|\sin y|}{1+\tan^2 y}}\,dy\right]$ (where [x] is greatest integer function) is

25. Let a_1 , a_2, a_3 ...., a_{11} be real numbers satisfying $a_1 = 15$, $27 - 2a_2 > 0$ and $a_k = 2a_{k-1} - a_{k-2}$ $\forall$ k = 3, 4, ..., 11. If $\frac{a_1^2 + a_2^2 + ... + a_{11}^2}{11} = 90$, then the value of $\frac{a_1 + a_2 + ... + a_{11}}{11}$ is equal to

NTA ABHYAS PAPER - 10

Single Choice

1. The solution of dy = cos x (2 – y cosec x)dx, where $y=\sqrt{2}$ when x = π/4, is

(A) $y=\sin x+\frac{1}{2}\operatorname{cosec} x$ (B) y = tan(x/2) + cot (x/2)

(C) $y=\left(1/\sqrt{2}\right)\sec(x/2)+\sqrt{2}\cos(x/2)$ (D) None of the above

2. The domain of the function f given by $f(x)=\frac{1}{\sqrt{[x]^2-[x]-6}}$ is

(A) (–∞, –2) (B) (–∞, –2) ∪ [4, ∞) (C) [4, ∞) (D) (–∞, –2] ∪ [4, ∞)

3. The area of the region (in square units) above the x-axis bounded by the curve $y=\tan x, 0\le x\le\frac{\pi}{2}$ and the tangent to the curve at $x=\frac{\pi}{4}$ is

(A) $\frac{1}{2}\left(\log 2-\frac{1}{2}\right)$ (B) $\frac{1}{2}(1+\log 2)$ (C) $\frac{1}{2}(1-\log 2)$ (D) $\frac{1}{2}\left(\log 2+\frac{1}{2}\right)$

4. Two men are on the opposite sides of a tower. They measure the angles of elevation of the top of the tower as 45° and 30° respectively. If the height of the tower is 40 m, then the distance between the men is

(A) 40 m (B) $40\sqrt{3}$m (C) 68.28 m (D) 109.28 m

5. Let C_1, C_2, C_3……. are the usual binomial coefficients where $C_r = {}^nC_r$. Let $S = C_1 + 2C_2 + 3C_3 +\ldots + nC_n$, then S is equal to

(A) $n2^n$ (B) 2^{n-1} (C) $n2^{n-1}$ (D) 2^{n+1}

6. If $p = \sin^2 x + \cos^4 x$, then

(A) $\frac{3}{4}\le p\le 1$ (B) $\frac{3}{16}\le p\le\frac{1}{4}$ (C) $\frac{1}{4}\le p\le\frac{1}{2}$ (D) None of these

7. If $p \Rightarrow (q \vee r)$ is False, then the truth values of p, q, r are respectively (where T is True and F is False)

(A) T, F, F (B) F, T, T (C) F, F, F (D) T, T, F

8. A box contains tickets numbered 1 to N. n tickets are drawn from the box with replacement. The probability that the largest number on the tickets is k, is

(A) $\left(\frac{k}{N}\right)^n$ (B) $\left(\frac{k-1}{N}\right)^n$ (C) 0 (D) None of these

9. The coordinates of the focus of the parabola described parametrically by $x = 5t^2 + 2$, $y = 10t+4$ are

(A) (7, 4) (B) (3, 4) (C) (3, –4) (D) (–7, 4)

10. The rate of change of $\sqrt{(x^2+16)}$ with respect to $\frac{x}{x-1}$ at x = 3 is

(A) 2 (B) $\frac{11}{5}$ (C) $-\frac{12}{5}$ (D) –3

11. Let z be a complex number such that $\left|\frac{z-i}{z+2i}\right| = 1$ and $|z| = \frac{5}{2}$. Then the value of $|z + 3i|$ is

(A) $\sqrt{10}$ (B) $\frac{7}{2}$ (C) $\frac{15}{4}$ (D) $2\sqrt{3}$

12. Let x, y and z be the respectively sum of the first n terms, the next n terms and the next n terms of a geometric progression, then x, y, z are in

(A) arithmetic progression (B) geometric progression

(C) harmonic progression (D) None of these

13. The function f(x) = {x} sin (π |x|), where [.] denotes the greatest integer function and {.} is he fractional part function, is discontinuous at

(A) all x (B) all integer points

(C) no x (D) x which is not an integer

14. If there are n number of seats and m number of people have to be seated, then the number of possible ways to do this is (here, m < n)

(A) ${}^nP_m$ (B) ${}^nC_m$ (C) ${}^nC_m \times (m-1)!$ (D) ${}^{n-1}P_{m-1}$

15. Let $I = \int_0^1 \frac{\sin x}{\sqrt{x}} dx$ and $J = \int_0^1 \frac{\cos x}{\sqrt{x}} dx$. Then, which one of the following is true ?

(A) $I > \frac{2}{3}$ and $J < 2$ (B) $I > \frac{2}{3}$ and $J > 2$ (C) $I < \frac{2}{3}$ and $J < 2$ (D) $I < \frac{2}{3}$ and $J > 2$

16. If $\begin{vmatrix} a^2 & b^2 & c^2 \\ (a+\lambda)^2 & (b+\lambda)^2 & (c+\lambda)^2 \\ (a-\lambda)^2 & (b-\lambda)^2 & (c-\lambda)^2 \end{vmatrix}$ then k is equal $= k\lambda \begin{vmatrix} a^2 & b^2 & c^2 \\ a & b & c \\ 1 & 1 & 1 \end{vmatrix}, \lambda \neq 0$ to :

(A) $4\lambda abc$ (B) $-4\lambda^2$ (C) $4\lambda^2$ (D) $-4\lambda abc$

17. Coefficient of variation of two distributions are 60% and 75%, and their standard deviation are 18 and 15 respectively, then their arithmetic means respectively are

(A) 30, 30 (B) 30, 20 (C) 20, 30 (D) 20, 20

18. The set $\{x \in R : \cos 2x + 2\cos^2 x = 2\}$ is equal to

(A) $\left\{2n\pi + \frac{\pi}{3} : n \in Z\right\}$ (B) $\left\{n\pi + \frac{\pi}{6} : n \in Z\right\}$

(C) $\left\{n\pi + \frac{\pi}{3} : n \in Z\right\}$ (D) $\left\{2n\pi - \frac{\pi}{3} : n \in Z\right\}$

19. $\lim_{x \to 0} \frac{\ln(1+x)}{x^2} + \frac{x-1}{x} =$

(A) ∞ (B) $\frac{1}{2}$ (C) $-\frac{1}{2}$ (D) 1

20. The abscissa(e) of the point(s), where the tangent to curve $y = x^3 - 3x^2 - 9x + 5$ is parallel to the x-axis is(are)

(A) $x = 0$ (B) $x = 1$ and -1 (C) $x = 1$ and -3 (D) $x = -1$ and 3

Subjective Numerical

21. The value of x ; $\forall\ x \in R$ which satisfy the equation $(x - 1)|x^2 - 4x + 3| + 2x^2 + 3x - 5 = 0$ is

22. Let $f(x) = \frac{9x}{25} + c, c > 0$. If the curve $y = f^{-1}(x)$ passes through $\left(\frac{1}{4}, -\frac{5}{4}\right)$ and g(x) is the antiderivative of $f^{-1}(x)$ such that $g(0) = \frac{5}{2}$, then the value of [g(1)] is, (where [.] represents the greatest integer function)

23. Let $x + \frac{1}{x} = 2, y + \frac{1}{y} = -2$ and $\sin^{-1} x + \cos^{-1} y = m\pi$, then the value of m is

24. If $\hat{i} \times \left[\left(\vec{a} - \hat{j}\right) \times \hat{i}\right] + \hat{j} \times \left[\left(\vec{a} - \hat{k}\right) \times \hat{j}\right] + \hat{k} \times \left[\left(\vec{a} - \hat{i}\right) \times \hat{k}\right] = 0$ and $\vec{a} = x\hat{i} + y\hat{j} + z\hat{k}$, then the value of $8(x^3 - xy + zx)$ is equal to

25. A circle touches the hypotenuse of a right-angled triangle at its midpoint and passes through the midpoint of the shorter side. If 3 units and 4 units are the length of the sides other than hypotenuse and r be the radius of the circle, then the value of 3r is :

ANSWER KEY

NTA ABHYAS PAPER-1

1.	A	2.	A	3.	B	4.	B	5.	D
6.	B	7.	D	8.	D	9.	B	10.	B
11.	C	12.	C	13.	A	14.	B	15.	A
16.	B	17.	D	18.	C	19.	B	20.	A
21.	2	22.	5	23.	3	24.	$3+2\sqrt{3}$	25.	5

NTA ABHYAS PAPER-2

1.	D	2.	A	3.	D	4.	D	5.	A
6.	B	7.	A	8.	B	9.	D	10.	C
11.	A	12.	A	13.	C	14.	C	15.	D
16.	B	17.	A	18.	B	19.	D	20.	D
21.	8	22.	8	23.	7	24.	3	25.	4

NTA ABHYAS PAPER-3

1.	A	2.	D	3.	D	4.	A	5.	D
6.	A	7.	A	8.	A	9.	C	10.	B
11.	A	12.	D	13.	C	14.	B	15.	D
16.	A	17.	C	18.	C	19.	B	20.	C
21.	4	22.	2	23.	53	24.	48	25.	1.25

NTA ABHYAS PAPER-4

1.	B	2.	C	3.	C	4.	B	5.	A
6.	B	7.	B	8.	A	9.	B	10.	D
11.	C	12.	B	13.	D	14.	D	15.	C
16.	B	17.	D	18.	A	19.	D	20.	A
21.	36	22.	25	23.	(–1)	24.	4	25.	5

NTA ABHYAS PAPER-5

1.	C	2.	A	3.	A	4.	B	5.	C
6.	D	7.	D	8.	C	9.	B	10.	A
11.	B	12.	A	13.	C	14.	A	15.	D
16.	B	17.	A	18.	D	19.	A	20.	B
21.	4	22.	8	23.	8	24.	–0.5	25.	6

NTA ABHYAS PAPER-6

1.	D	2.	B	3.	B	4.	A	5.	C
6.	C	7.	B	8.	A	9.	D	10.	D
11.	B	12.	C	13.	D	14.	B	15.	A
16.	B	17.	C	18.	C	19.	C	20.	B
21.	16	22.	1	23.	10	24.	37	25.	3

NTAABHYAS PAPER-7

1.	A	**2.**	C	**3.**	C	**4.**	B	**5.**	A
6.	B	**7.**	D	**8.**	C	**9.**	D	**10.**	A
11.	B	**12.**	C	**13.**	B	**14.**	C	**15.**	B
16.	B	**17.**	D	**18.**	A	**19.**	D	**20.**	C
21.	**0**	**22.**	**1**	**23.**	**2**	**24.**	**3**	**25.**	**6**

NTA_ABHYAS PAPER-8

Q.1	(C)	**Q.2**	(C)	**Q.3**	(C)	**Q.4**	(C)	**Q.5**	(B)
Q.6	(D)	**Q.7**	(B)	**Q.8**	(B)	**Q.9**	(B)	**Q.10**	(B)
Q.11	(A)	**Q.12**	(B)	**Q.13**	(C)	**Q.14**	(A)	**Q.15**	(B)
Q.16	(A)	**Q.17**	(A)	**Q.18**	(D)	**Q.19**	(C)	**Q.20**	(B)
Q.21	**10**	**Q.22**	**16**	**Q.23**	**1**	**Q.24**	**7**	**Q.25**	**1**

NTA_ABHYAS PAPER-9

1.	A	**2.**	C	**3.**	D	**4.**	A	**5.**	C
6.	B	**7.**	B	**8.**	A	**9.**	D	**10.**	C
11.	A	**12.**	A	**13.**	B	**14.**	D	**15.**	B
16.	C	**17.**	A	**18.**	C	**19.**	D	**20.**	B
21.	**3**	**22.**	**0**	**23.**	**9**	**24.**	2	**25.**	**0**

NTA_ABHYAS PAPER-10

1.	A	**2.**	B	**3.**	A	**4.**	D	**5.**	C
6.	A	**7.**	A	**8.**	D	**9.**	A	**10.**	C
11.	B	**12.**	B	**13.**	C	**14.**	A	**15.**	C
16.	C	**17.**	B	**18.**	B	**19.**	B	**20.**	D
21.	**1**	**22.**	**2**	**23.**	**1.5**	**24.**	1	**25.**	**5**