| MATHEMATICS | TEST PAPER WITH ANSWER |
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## SECTION-A

**1.** For $z \in \mathbb{C}$ if the minimum value of $\left(|z-3\sqrt{2}|+|z-p\sqrt{2}i|\right)$ is $5\sqrt{2}$, then a value of p is _____

(A) 3          (B) $\dfrac{7}{2}$

(C) 4          (D) $\dfrac{9}{2}$

**Official Ans. by NTA (C)**

**Ans. (C)**

**2.** The number of real values $\lambda$, such that the system of linear equations

2x – 3y + 5z = 9

x + 3y – z = –18

3x – y + $(\lambda^2 - |\lambda|)$z = 16

has no solution, is :-

(A) 0          (B) 1

(C) 2          (D) 4

**Official Ans. by NTA (C)**

**Ans. (C)**

**3.** The number of bijective functions f : {1, 3, 5, 7,........99} $\to$ {2, 4, 6, 8,......., 100}, such that $f(3) \geq f(9) \geq f(15) \geq f(21) \geq ..... \geq f(99)$, is _____

(A) $^{50}P_{17}$          (B) $^{50}P_{33}$

(C) 33! × 17!          (D) $\dfrac{50!}{2}$

**Official Ans. by NTA (B)**

**Ans. (B)**

**4.** The remainder when $(11)^{1011} + (1011)^{11}$ is divided by 9 is

(A) 1          (B) 4

(C) 6          (D) 8

**Official Ans. by NTA (D)**

**Ans. (D)**

**5.** The sum $\displaystyle\sum_{n=1}^{21} \dfrac{3}{(4n-1)(4n+3)}$ is equal to

(A) $\dfrac{7}{87}$          (B) $\dfrac{7}{29}$

(C) $\dfrac{14}{87}$          (D) $\dfrac{21}{29}$

**Official Ans. by NTA (B)**

**Ans. (B)**

**6.** $\displaystyle\lim_{x \to \frac{\pi}{4}} \dfrac{8\sqrt{2}-(\cos x + \sin x)^7}{\sqrt{2}-\sqrt{2}\sin 2x}$ is equal to

(A) 14          (B) 7

(C) $14\sqrt{2}$          (D) $7\sqrt{2}$

**Official Ans. by NTA (A)**

**Ans. (A)**

**7.** $\displaystyle\lim_{n \to \infty} \dfrac{1}{2^n}\left( \dfrac{1}{\sqrt{1-\frac{1}{2^n}}} + \dfrac{1}{\sqrt{1-\frac{2}{2^n}}} + \dfrac{1}{\sqrt{1-\frac{3}{2^n}}} + ...... + \dfrac{1}{\sqrt{1-\frac{2^n-1}{2^n}}} \right)$

is equal to

(A) $\dfrac{1}{2}$          (B) 1

(C) 2          (D) –2

**Official Ans. by NTA (C)**

**Ans. (C)**

**8.** If A and B are two events such that $P(A) = \dfrac{1}{3}, P(B) = \dfrac{1}{5}$ and $P(A \cup B) = \dfrac{1}{2}$, then $P(A \mid B') + P(B \mid A')$ is equal to

(A) $\dfrac{3}{4}$          (B) $\dfrac{5}{8}$

(C) $\dfrac{5}{4}$          (D) $\dfrac{7}{8}$

**Official Ans. by NTA (B)**

**Ans. (B)**

**9.** Let [t] denote the greatest integer less than or equal to t. Then the value of the integral $\int_{-3}^{101}([\sin(\pi x)]+e^{[\cos(2\pi x)]})dx$ is equal to

(A) $\dfrac{52(1-e)}{e}$

(B) $\dfrac{52}{e}$

(C) $\dfrac{52(2+e)}{e}$

(D) $\dfrac{104}{e}$

**Official Ans. by NTA (B)**

   **Ans. (B)**

**10.** Let the point P ($\alpha$, $\beta$) be at a unit distance from each of the two lines $L_1$ : $3x - 4y + 12 = 0$, and $L_2$ : $8x + 6y + 11 = 0$. If P lies below $L_1$ and above $L_2$, then $100\ (\alpha + \beta)$ is equal to

(A) −14

(B) 42

(C) −22

(D) 14

**Official Ans. by NTA (D)**

   **Ans. (D)**

**11.** Let a smooth curve y = f(x) be such that the slope of the tangent at any point (x, y) on it is directly proportional to $\left(\dfrac{-y}{x}\right)$. If the curve passes through the point (1, 2) and (8, 1), then $\left|y\left(\dfrac{1}{8}\right)\right|$ is equal to

(A) $2\log_e 2$

(B) 4

(C) 1

(D) $4\log_e 2$

**Official Ans. by NTA (B)**

   **Ans. (B)**

**12.** If the ellipse $\dfrac{x^2}{a^2}+\dfrac{y^2}{b^2}=1$ meets the line $\dfrac{x}{7}+\dfrac{y}{2\sqrt{6}}=1$ on the x-axis and the line $\dfrac{x}{7}-\dfrac{y}{2\sqrt{6}}=1$ on the y-axis, then the eccentricity of the ellipse is

(A) $\dfrac{5}{7}$

(B) $\dfrac{2\sqrt{6}}{7}$

(C) $\dfrac{3}{7}$

(D) $\dfrac{2\sqrt{5}}{7}$

**Official Ans. by NTA (A)**

   **Ans. (A)**

**13.** The tangents at the point A(1, 3) and B(1, −1) on the parabola $y^2 - 2x - 2y = 1$ meet at the point P. Then the area (in unit²) of the triangle PAB is :-

(A) 4

(B) 6

(C) 7

(D) 8

**Official Ans. by NTA (D)**

   **Ans. (D)**

**14.** Let the foci of the ellipse $\dfrac{x^2}{16}+\dfrac{y^2}{7}=1$ and the hyperbola $\dfrac{x^2}{144}-\dfrac{y^2}{\alpha}=\dfrac{1}{25}$ coincide. Then the length of the latus rectum of the hyperbola is:-

(A) $\dfrac{32}{9}$

(B) $\dfrac{18}{5}$

(C) $\dfrac{27}{4}$

(D) $\dfrac{27}{10}$

**Official Ans. by NTA (D)**

   **Ans. (D)**

**15.** A plane E is perpendicular to the two planes $2x - 2y + z = 0$ and $x - y + 2z = 4$, and passes through the point P(1, −1, 1). If the distance of the plane E from the point Q(a, a, 2) is $3\sqrt{2}$, then (PQ)² is equal to

(A) 9

(B) 12

(C) 21

(D) 33

**Official Ans. by NTA (C)**

   **Ans. (C)**

**16.** The shortest distance between the lines $\dfrac{x+7}{-6}=\dfrac{y-6}{7}=z$ and $\dfrac{7-x}{2}=y-2=z-6$ is

(A) $2\sqrt{29}$

(B) 1

(C) $\sqrt{\dfrac{37}{29}}$

(D) $\dfrac{\sqrt{29}}{2}$

**Official Ans. by NTA (A)**

   **Ans. (A)**

**17.** Let $\vec{a} = \hat{i} - \hat{j} + 2\hat{k}$ and $\vec{b}$ be a vector such that $\vec{a} \times \vec{b} = 2\hat{i} - \hat{k}$ and $\vec{a}.\vec{b} = 3$. Then the projection of $\vec{b}$ on the vector $\vec{a} - \vec{b}$ is :-

(A) $\dfrac{2}{\sqrt{21}}$  (B) $2\sqrt{\dfrac{3}{7}}$

(C) $\dfrac{2}{3}\sqrt{\dfrac{7}{3}}$  (D) $\dfrac{2}{3}$

**Official Ans. by NTA (A)**

**Ans. (A)**

**18.** If the mean deviation about median for the number 3, 5, 7, 2k, 12, 16, 21, 24 arranged in the ascending order, is 6 then the median is

(A) 11.5  (B) 10.5
(C) 12  (D) 11

**Official Ans. by NTA (D)**

**Ans. (D)**

**19.** $2\sin\left(\dfrac{\pi}{22}\right)\sin\left(\dfrac{3\pi}{22}\right)\sin\left(\dfrac{5\pi}{22}\right)\sin\left(\dfrac{7\pi}{22}\right)\sin\left(\dfrac{9\pi}{22}\right)$

is equal to

(A) $\dfrac{3}{16}$  (B) $\dfrac{1}{16}$

(C) $\dfrac{1}{32}$  (D) $\dfrac{9}{32}$

**Official Ans. by NTA (B)**

**Ans. (B)**

**20.** Consider the following statements :

P : Ramu is intelligent

Q : Ramu is rich

R : Ramu is not honest

The negation of the statement "Ramu is intelligent and honest if and only if Ramu is not rich" can be expressed as :

(A) $((P \wedge (\sim R)) \wedge Q) \wedge ((\sim Q) \wedge ((\sim P) \vee R))$

(B) $((P \wedge R) \wedge Q) \vee ((\sim Q) \wedge ((\sim P) \vee (\sim R)))$

(C) $((P \wedge R) \wedge Q) \wedge ((\sim Q) \wedge ((\sim P) \vee (\sim R)))$

(D) $((P \wedge (\sim R)) \wedge Q) \vee ((\sim Q) \wedge ((\sim P) \vee R))$

**Official Ans. by NTA (D)**

**Ans. (D)**

**SECTION-B**

**1.** Let A : {1, 2, 3, 4, 5, 6, 7}. Define B = {T $\subseteq$ A : either $1 \notin T$ or $2 \in T$ } and C = T $\subseteq$ A : T the sum of all the elements of T is a prime number}. Then the number of elements in the set $B \cup C$ is _____

**Official Ans. by NTA (107)**

**Ans. (107)**

**2.** Let f(x) be a quadratic polynomial with leading coefficient 1 such that f(0) = p, $p \neq 0$ and $f(1) = \dfrac{1}{3}$. If the equation f(x) = 0 and fofofof(x) = 0 have a common real root, then f(–3) is equal to.....................

**Official Ans. by NTA (25)**

**Ans. (25)**

**3.** Let $A = \begin{bmatrix} 1 & a & a \\ 0 & 1 & b \\ 0 & 0 & 1 \end{bmatrix}, a, b \in \mathbb{R}$. If for some $n \in N$,

$A^n = \begin{bmatrix} 1 & 48 & 2160 \\ 0 & 1 & 96 \\ 0 & 0 & 1 \end{bmatrix}$ then n + a + b is equal to _____

**Official Ans. by NTA (24)**

**Ans. (24)**

**4.** The sum of the maximum and minimum values of the function f(x) = |5x – 7| + [x² + 2x] is the interval $\left[\dfrac{5}{4}, 2\right]$, where [t] is the greatest integer $\leq t$ is _____

**Official Ans. by NTA (15)**

**Ans. (15)**

**5.** Let y = y(x) be the solution of the differential equation $\dfrac{dy}{dx} = \dfrac{4y^3 + 2yx^2}{3xy^2 + x^3}, y(1) = 1$. If for some $n \in N, y(2) \in [n-1, n)$, then n is equal to _____

**Official Ans. by NTA (3)**

**Ans. (3)**

**6.** Let f be a twice differentiable function on R. If $f'(0) = 4$ and

$$f(x) + \int_0^x (x-t)f'(t)dt = (e^{2x} + e^{-2x})\cos 2x + \frac{2}{a}x,$$

then $(2a+1)^5 a^2$ is equal to _____

**Official Ans. by NTA (8)**

**Ans. (8)**

**7.** Let $a_n = \int_{-1}^n \left(1 + \frac{x}{2} + \frac{x^2}{2} + \frac{x^3}{3} + ....... + \frac{x^{n-1}}{n}\right)dx$

for $n \in N$. Then the sum of all the elements of the set $\{n \in N : a_n \in (2,30)\}$ is _____

**Official Ans. by NTA (5)**

**Ans. (5)**

**8.** If the circles $x^2 + y^2 + 6x + 8y + 16 = 0$ and

$x^2 + y^2 + 2(3 - \sqrt{3})x + x + 2(4 - \sqrt{6})y$

$= k + 6\sqrt{3} + 8\sqrt{6}, k > 0$, touch internally at the

point $P(\alpha, \beta)$, then $(\alpha + \sqrt{3})^2 + (\beta + \sqrt{6})^2$ is

equal to _____

**Official Ans. by NTA (25)**

**Ans. (25)**

**9.** Let the area enclosed by the x-axis, and the tangent and normal drawn to the curve $4x^3 - 3xy^2 + 6x^2 - 5xy - 8y^2 + 9x + 14 = 0$ at the point $(-2, 3)$ be A. Then 8A is equal to _____

**Official Ans. by NTA (170)**

**Ans. (170)**

**10.** Let $x = \sin(2\tan^{-1}\alpha)$ and $y = \sin\left(\frac{1}{2}\tan^{-1}\frac{4}{3}\right)$. If

$S = \{\alpha \in R : y^2 = 1 - x\}$, then $\sum_{\alpha \in S} 16\alpha^3$ is equal to

_____

**Official Ans. by NTA (130)**

**Ans. (130)**