अनुक्रमांक | | | | | |

C ^PS–(1136) Maths. (E)

Annual Exam - 2023-24
Class – XI
Subject – Mathematics

Time : 3¼ Hours **Total Marks : 100**

Section – A

1. Objective questions—

(i) If set A has 3 elements and set B = {3, 4, 5}, then number of elements in (A × B) will be— 1

(a) 8 (b) 9

(c) 10 (d) 6

(ii) The value of $\sin\frac{31\pi}{3}$ will be— 1

(a) $\frac{3}{2}$ (b) $\frac{\sqrt{3}}{2}$

(c) $\frac{2}{3}$ (d) $\frac{\sqrt{2}}{3}$

(iii) The value of $\frac{7!}{5!}$ will be— 1

(a) 36 (b) 42

(c) 40 (d) 24

(iv) The common ratio of the G.P. $\sqrt{3}, \frac{1}{\sqrt{3}}, \frac{1}{3\sqrt{3}}$..... will be — 1

(a) $\frac{1}{3}$ (b) $\frac{1}{\sqrt{3}}$

(c) $\sqrt{3}$ (d) 3

(v) A line makes an angle of 30° with the positive directon of x-axis. Find the slope of the line— 1

(a) $\frac{\sqrt{3}}{2}$ (b) $\sqrt{3}$

(c) $\frac{1}{\sqrt{3}}$ (d) $\frac{2}{\sqrt{3}}$

P.T.O.

(vi) Co-ordinates of the focus of the parabola $x^2 = -8y$ is— 1

(a) (2, 0) (b) (0, 2)

(c) (−2, 0) (d) (0, −2)

2. Verty short answer type questions—

(i) Write the set of the letters of the word " TRIGONOMETRY". 1

(ii) Convert $\frac{5\pi}{3}$ in radian measure. 1

(iii) Express $(-5i)\left(\frac{1}{8i}\right)$ in a + *i*b form. 1

(iv) Expand the expression $(a + b)^n$. 1

(v) Find the equation of the circle with centre (–3, 2) and radius 4 unit. 1

(vi) Name the octants in which the points (4, −2, 3) and (−4, 2, 5) lies. 1

(vii) If the standard deviation of obtained marks of a class sutdents is 1.6, then find the variance. 1

(viii) A coin is tossed thrice, then find the sample space. 1

3. Short answer type questions—

(i) $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $A = \{1, 2, 3, 4\}$ and $B = \{2, 4, 6, 8\}$ then find $(A \cup B)'$? 2

(ii) If $P = \{1, 2\}$, then find the set $P \times P \times P$? 2

(iii) Solve the inequality $7x + 3 < 5x + 9$ and show the graph of the solution on number line ? 2

(iv) If ${}^nc_9 = {}^nc_8$, then find the value of ${}^nc_{17}$? 2

(v) Expand the expression $(x - 2y)^5$. 2

(vi) Find the 20th terms of the G.P. $\frac{5}{2}, \frac{5}{4}, \frac{5}{8}$..... ? 2

(vii) Find the value of the limit $\lim_{x \to 0} \frac{\sin ax}{bx}$, $b \neq 0$ 2

(viii) A coin is tossed twice. Find the probability of atleast one tail. 2

Section – B

4. Let $A = \{1, 2, 3, ...14\}$. Define a relation R from A to A by $R = \{(x, y); 3x - y = 0$, where $x, y \in A\}$. Write down its domain, codomain and range. 3

5. Prove that— 3

$$3 \sin \frac{\pi}{6} \sec \frac{\pi}{3} - 4 \sin \frac{5\pi}{6} \cot \frac{\pi}{4} = 1$$

6. Express the following complex number in the form $a + ib$. 3

$$\frac{5+\sqrt{2}\,i}{1-\sqrt{2}\,i}$$

7. Solve the following inequality and show the graph of the solution on number line : $\frac{3x-4}{2} \geq \frac{x+1}{4} - 1$ 3

8. Using Binomial theorem, evaluate the following $(102)^5$. 3

9. The vertices of ΔPQR are $P(2, 1)$, $Q(-2, 3)$ and $R(4, 5)$. Find the equation of the median through the vertex R. 3

10. Find the distance of the point $(3, -5)$ from the line $3x - 4y - 26 = 0$. 3

11. Find the equation of the set of points which are equidistant from the points $(1, 2, 3)$ and $(3, 2, -1)$. 3

12. Evaluate the given limit— $\lim_{x \to 0} \frac{ax + x\cos x}{b\sin x}$, $b \neq 0$. 3

13. Express the following expression in the from of $a + ib$; $\frac{(3-2i)(2+3i)}{(1+2i)(2-i)}$. 3

Section – C

14. If $A = \{3, 5, 7, 9, 11\}$, $B = \{7, 9, 11, 13\}$, $C = \{11, 13, 15\}$ and $D = \{15, 17\}$. Find— 4

(i) $B \cap D$ (ii) $A \cap (B \cup C)$ (iii) $A \cap C$ (iv) $A \cap (B \cup D)$

15. Find the derivative of 'tan x' from first principal ? 4

16. A committee of 3 persons is to be constituted from a group of 2 men and 3 women. In how many ways can this be done ? How many of these committees would consist of 1 man and 2 women ? 4

17. If a, b, c, d are in G.P., then show that $(a^2 + b^2 + c^2)(b^2 + c^2 + d^2) = (ab + bc + cd)^2$ https://www.rajasthanboard.com 4

18 For the function $f(x) = \frac{x^{100}}{100} + \frac{x^{99}}{99} + \ldots\ldots + \frac{x^2}{2} + x + 1$,

Prove that— $f'(1) = 100\, f'(0)$. 4

Section – D

19. Prove that— $\frac{\sin 5x + \sin 3x}{\cos 5x + \cos 3x} = \tan 4x$ 5

P.T.O.

OR

Prove that : $\cos\left(\frac{\pi}{4}+x\right)+\cos\left(\frac{\pi}{4}-x\right)=\sqrt{2}\cos x$.

20. Find the co-ordinates of the foci, the vertices, the lengths of major and minor axes and the eccentricity of the ellipse $9x^2 + 4y^2 = 36$. 5

OR

Find the co-ordinates of the foci, and the vertices, the eccentricity, the length of the latus rectum of the hyperbola $\frac{x^2}{9}-\frac{y^2}{16}=1$.

21. Find the mean deviation about the mean for the following data— 5

Marks Obtained	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Number of Students	2	3	8	14	8	3	2

OR

Calculate the mean, variance and standard deviation for the following distribution—

Class	30-40	40-50	50-60	60-70	70-80	80-90	90-100
Frequency	3	7	12	15	8	3	2

22. In class XIth of a school 40% of students study Mathematics and 30% study Biology. 10% of the class study both Mathematics and Biology. If a student is selected a random from the class, find the probability that he will be studying Mathematics or Biology. 5

OR

Three coins are tossed once. Find the probability of getting—

(i) 3 heads

(ii) atleast 2 heads

(iii) exactly two tails

(iv) atmost two tails