

O. P. JINDAL SCHOOL, SAVITRI NAGAR
Annual Examination - (2023 – 2024) **A**

Class: XI

MM: 80

Subject: Mathematics

Time: 3 Hrs.

(Fifteen Minutes Extra will be given for reading the Question Paper.)

General Instructions:

- i. This question paper has 5 sections A-E.
- ii. Section A has 20 MCQs carrying 1 mark each.
- iii. Section B has 5 questions carrying 2 mark each.
- iv. Section C has 6 questions carrying 3 mark each.
- v. Section D has 4 questions carrying 5 mark each.
- vi. Section E has 3 case based integrated units of assessment (04 marks each) with 4 sub- parts of 1 mark each.
- vii. All the questions are compulsory. However an internal choice in 2 Qs of 5 marks, 3 Qs of 3 marks, 2 Qs of 2 marks has been provided.
- viii. Draw neat figures wherever required. Take $\pi = 22/7$ wherever required if not stated.

SECTION A

1. The domain of the function f given by $f(x) = \frac{x^2 + 2x + 1}{x^2 - x - 6}$ is
 a) $\mathbf{R} - \{2, -3\}$ b) $\mathbf{R} - \{-3, 2\}$ c) $\mathbf{R} - \{3, -2\}$ d) $\mathbf{R} - \{-3, -2\}$
2. Let A and B be two sets then $A \cap (A \cup B)$ is equal to
 a) A b) B c) ϕ d) $(A \cap B)$
3. The value of $\sin 105^\circ$ is
 a) $\frac{\sqrt{3} + 1}{2\sqrt{2}}$ b) $\frac{\sqrt{3} - 1}{2\sqrt{2}}$ c) $\sqrt{3} - 1$ d) $\frac{2 - \sqrt{3}}{2\sqrt{2}}$
4. Value is i^{-38} is
 a) i b) -i c) 1 d) -1
5. If $|x - 3| < 2$ and $x \in \mathbf{R}$, then its solution set is:
 a) $1 < x < 5$ b) $-2 < x < 2$ c) $2 < x < -2$ d) $-1 < x < 5$
6. If ${}^n P_5 = 20 \cdot {}^n P_3$, then $n = ?$
 a) 8 b) 9 c) 10 d) 11
7. How many different teams of 7 players can chosen out of 10 players?
 a) 720 b) 70 c) 120 d) 360
8. The 4th term in the expansion of $(x - 2y)^{12}$ is
 a) $1760x^8y^6$ b) $-440x^7y^5$ c) $-1760x^9y^3$ d) none of these
9. If $(k - 1)$, $(2k + 1)$ and $(6k + 3)$ are in GP then $k = ?$
 a) 7 b) 4 c) -2 d) 0

10. The slope of the line AB passing through the points A(-2, 3) and B(8, -5) is
 a) $\frac{4}{5}$ b) $-\frac{4}{5}$ c) $\frac{5}{4}$ d) $-\frac{5}{4}$
11. The centre of the circle $x^2 + y^2 - 6x + 4y - 12 = 0$ is
 a) (-3, 2) b) (3, 2) c) (3, -2) d) (-3, -2)
12. For the parabola $x^2 = -16y$, the focus and the equation of directrix are respectively
 a) F(0, 4), $y = 4$ b) F(0, -4), $y = 4$ c) F(0, 4), $y = -4$ d) F(0, -4), $y = -4$
13. The distance of the point P(4, 1) from the line $3x - 4y + 12 = 0$ is
 a) 4 units b) 5 units c) 6 units d) 3 units
14. If $y = 2\tan x + 5x$, then $\frac{dy}{dx}$ at $x = \frac{\pi}{4}$ is equal to
 a) 9 b) 4 c) 5 d) 3
15. The coordinate of the foot of perpendicular drawn from a point (6, 7, 8) on x-axis are
 a) (6, 0, 0) b) (0, 7, 0) c) (0, 0, 8) d) (0, 7, 8)
16. The mean deviation of the data 2, 9, 9, 3, 6, 9, 4 from the mean is
 a) 2.23 b) 2.57 c) 3.23 d) 3.57
17. A die is rolled, the probability that a number 1 or 6 may appear is
 a) $\frac{2}{3}$ b) $\frac{5}{6}$ c) $\frac{1}{3}$ d) $\frac{1}{2}$
18. Given $P(A) = \frac{2}{5}$ and $P(B) = \frac{1}{4}$, then $P(A \text{ and } B)$, if A and B are mutually exclusive events is
 a) $\frac{13}{20}$ b) $\frac{3}{5}$ c) $\frac{4}{5}$ d) 0

DIRECTIONS: In the question number 19 and 20, a statement of **Assertion(A)** is followed by a statement of **Reason(R)**. Choose the correct option

- (A) Both assertion(A) and reason(R) are true and reason(R) is the correct explanation of assertion(A)
 (B) Both assertion(A) and reason(R) are true and reason(R) is not the correct explanation of assertion(A)
 (C) Assertion(A) is true but reason(R) is false
 (D) Assertion(A) is false but reason(R) is true.

19. **Assertion(A):** The value of $\lim_{x \rightarrow 3} 2(x^2 - x + 1)$ is 3.

Reason(R): $\lim_{x \rightarrow a} [f(x) \cdot g(x)] = \lim_{x \rightarrow a} f(x) \cdot \lim_{x \rightarrow a} g(x)$.

20. **Assertion(A):** x - coordinate of any point lie on yz plane is 0.

Reason(R): Distance of any point P(x_1, y_1, z_1) from origin is $\sqrt{x_1^2 + y_1^2 + z_1^2}$.

SECTION B

21. If $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $A = \{2, 4, 6, 8\}$, $B = \{2, 3, 5, 7\}$, verify that $(A \cup B)' = (A' \cap B')$.

22. Prove that $\frac{\sin 2\theta}{1 + \cos 2\theta} = \tan \theta$.

OR

Find the value of $\sin\left(-\frac{11\pi}{3}\right)$.

23. Find the conjugate of $(6 + 5i)^2$.

24. Find the equation of ellipse whose vertices are at $(\pm 6, 0)$ and foci at $(\pm 4, 0)$.

OR

Find the equation of the circle with centre at $(-2, 3)$ and radius is $\sqrt{5}$ units.

25. Find the point on the y axis which is at a distance of $\sqrt{10}$ units from the point $(1, 2, 3)$.

SECTION C

26. Prove that $\sin 3x + \sin 2x - \sin x = 4 \sin x \cos \frac{x}{2} \cos \frac{3x}{2}$.

OR

Prove that $\cot 4x(\sin 5x + \sin 3x) = \cot x(\sin 5x - \sin 3x)$.

27. Find the coefficient of x^{18} in the expansion of $\left(x^2 + \frac{3a}{x}\right)^{15}$.

28. Find the equation of line parallel to the line $3x - 4y + 2 = 0$ and passing through the point $(-2, 3)$.

OR

Find the angle between the lines $\sqrt{3}x + y = 1$ and $x + \sqrt{3}y = 1$.

29. Find the ratio in which YZ- plane divides the line segment formed by joining the points $(-2, 4, 7)$ and $(3, -5, 8)$.

30. Find the mean deviation about the mean for the following data.

x_j	10	30	50	70	90
f_j	4	24	28	16	8

31. Differentiate $\left(\frac{5x^2 - 3x}{x + 5}\right)$ with respect to x .

SECTION D

32. A rod of length 12 cm moves with its ends always touching the coordinate axes. Determine the equation of locus of a point P on the rod, which is 3 cm from the end in contact with the x axis.

OR

An arc is in the form of a semi ellipse. It is 8 m wide and 2 m high at the centre. Find the height of the arch at a point 1.5 m from one end.

33. Find the derivative of $\cos(x + 1)$ from first principle.

34. If a, b, c, d are in G.P, show that : $(a^2 + b^2 + c^2)(b^2 + c^2 + d^2) = (ab + bc + cd)^2$.

OR

Find the sum of the following series upto n terms.
 $0.6 + 0.66 + 0.666 + \dots$

35. Find the coordinate of the foot of the perpendicular from the point (-1, 3) to the line $3x - 4y - 16 = 0$.

SECTION E

36. Republic day is a national holiday of India. It honours the date on which the constitution of India came into effect on 26 January 1950 replacing the government of India Act (1935) as the governing document of India and thus, turning the nation into a newly formed republic.

- (i) Find the number of arrangement of the letters of the word "REPUBLIC" . 1
(ii) How many arrangements start with a vowel? 2

OR

How many arrangements start with R and end with C?

- (iii) How many 3 letters word with or without meaning can be formed from the word "REPUBLIC". 1

37. A company produces 500 computers in the third year and 600 computers in the seventh year. Assuming that the production increases uniformly by a constant number every year. Based on the above information answer the following questions:

- (i) Find the value of the fixed number by which the production is increasing every year. 1
(ii) Find the production in first year. 1
(iii) Find the total production in 10 years. 2

OR

Find the number of production in 21st year.

38. An urn contains 7 white, 5 black and 3 red balls. Two balls are drawn at random. Based on the above information answer the following questions, find

- (i) Total number of sample space. 1
(ii) the probability that both the balls are red 2

OR

- the probability that one ball is white
(iii) the probability that both the balls are neither of the three colours. 1
