O. P. JINDAL SCHOOL, SAVITRI NAGAR

Annual Examination - (2022 – 2023)

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. Let A = {1, 2, 3}, B = {2, 3, 4}, then which of the following is a function from A to B?

a) {(1,2), (1, 3), (2,3), (3, 3)} b) {(1, 3), (2, 4)}

c) {(1,2), (2, 3), (3, 2), (3, 4)} d) {(1, 3), (2, 2), (3, 3)}

2. Let A and B be two sets such that n(A) = 21, n(B) = 17 and n(A ∪ B) = 27, then n(A ∩ B) is equal to

a) 18 b) 11 c) 521 d) 23

3. The value of $\sin 75^0$ 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 of $\sqrt{-25}\times\sqrt{-49}$ is

a) 35 b) -35 c) 35i d) -35i

5. If $|x-3|<2$ and $x \in R$, then its solution set is:

a) $1<x<5$ b) $-2<x<2$ c) $2<x<-2$ d) $-1<x<5$

6. The number of possible outcomes when a coin is tossed 6 times is

a) 36 b) 12 c) 64 d) 32

7. The number of ways in which the letters of the word "ARRANGE" can be permuted such that R's occur together.

a) $\frac{7!}{2!X2!}$ b) $\frac{6!}{2!}$ c) 6! d) none of these

8. The coefficient of x^7 in the expansion of $\left(3x-\frac{1}{x}\right)^6$ is

a) 405 b) 1215 c) 2430 d) 3645

9. Which term of GP 5, 10, 20, 40, ... is 5120?

a) 9^{th} b) 10^{th} c) 11^{th} d) 12^{th}

10. The distance of point P(4, 1) from the line $3x - 4y + 12 = 0$ is

a) 4 units b) 5 units c) 3 units d) 6 units

11. The foci of an ellipse are $(0, \pm 5)$ and its vertices are $(0, \pm 13)$. The equation of the ellipse is

a) $\frac{x^2}{169}+\frac{y^2}{144}=1$ b) $\frac{x^2}{169}+\frac{y^2}{25}=1$ c) $\frac{x^2}{144}+\frac{y^2}{169}=1$ d) $\frac{x^2}{25}+\frac{y^2}{169}=1$

12. The point (-4, 3, -5) lies in the

a) 6^{th} octant b) 3^{rd} octant c) 4^{th} octant d) 8^{th} octant

13. L is the foot of the perpendicular drawn from a point (3, 4, 5) on X- axis . The coordinate of L are

a) (3, 0, 0) b) (0, 4, 0) c) (0, 0, 5) d) (0, 4, 5)

14. If $y = \sin^2 x$, then $\frac{dy}{dx}$ at $x = \frac{\pi}{4}$ is equal to

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

15. $\lim_{x \to 0} \frac{(1+x)^n - 1}{x}$ is equal to:

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

16. The mean deviation of the data 3, 10, 10, 4, 7, 10, 5 from the mean is

a) 2 b) 2.57 c) 3 d) 3.75

17. In a non leap year, the probability of having 53 Tuesday or 53 Wednesday is

a) $\frac{1}{7}$ b) $\frac{2}{7}$ c) $\frac{3}{7}$ d) $\frac{4}{7}$

18. Given $P(A) = \frac{3}{5}$ and $P(B) = \frac{1}{5}$, then P(A or B), if A and B are mutually exclusive events is

a) $\frac{2}{3}$ b) $\frac{3}{5}$ c) $\frac{4}{5}$ d) 1

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): Slope of the line $3x - 4y + 10 = 0$ is $\frac{3}{4}$.

Reason(R): x- intercept and y- intercept of $3x - 4y + 10 = 0$ respectively are $\frac{-10}{3}$ and $\frac{5}{2}$ respectively .

20. Assertion(A): If the equation of circle is $(x + 1)^2 + (y - 1)^2 = 4$, then its radius is 4.
Reason(R): Equation of circle with radius r is given by $(x - a)^2 + (y - b)^2 = r^2$.

SECTION B

21. Draw venn diagram for the following sets:
a) $(A - B) \cup (B - A)$ b) $(A \cup B)'$

22. Find the value of $2\sin 15^0 \cos 75^0$

OR

Find the value of $\cos(-870^0)$.

23. Express $\left(\frac{5+\sqrt{2}i}{1-\sqrt{2}i}\right)$ in the form of $(a + ib)$.

24. Find the equation of parabola with vertex at the origin and focus F(0. 5) .

OR

Find the equation of the ellipse with foci are at $(\pm 1, 0)$ and eccentricity $= \frac{1}{2}$.

25. Find the point on the z axis which is equidistant from the point A(1, 5, 7) and B(5, 1, -4) .

SECTION C

26. Find the number of ways in which 5 ladies and 5 gentlemen may be seated in a row so that no two ladies are together.

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

OR

The coefficient of three consecutive terms in the expansion of $(1 + x)^n$ are in the ratio 1 : 7 : 42. Find n.

28. Prove that $\cos x \cos 2x \cos 4x \cos 8x = \frac{\sin 16x}{16 \sin x}$.

OR

Prove that $(\sin 3x + \sin x)\sin x + (\cos 3x - \cos x)\cos x = 0$

29. Find the equation of the line perpendicular to the line $4x + 3y - 9 = 0$ and passes through the point (2, 3) .

30. Three vertices of a parallelogram ABCD are A(3, -1, 2), B(1, 2, -4), C(-1, 1, 2). Find the coordinate of the fourth vertex D.

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

OR

Differentiate $(2x+ 3)^3 \sin^2 5x$ with respect to x .

SECTION D

32. The mean and standard deviation of 20 observation are found to be 10 and 2 respectively . On rechecking it was found that an observation 8 was incorrect . Calculate the correct mean and standard deviation if it is replaced by 12 .

OR

Find the mean and variance of the following frequency distribution

Class	0-10	10-20	20-30	30-40	40-50
Frequency	7	9	19	10	5

33. a) Find the derivative of sin(2x – 5) from first principle.

b) Evaluate :$\lim_{x\to 0} \frac{sin5x}{sin3x}$, a , b $\neq$ 0.

34. Find the sum of the series 3 X 8 + 6 X 11 + 9 X 14 + … to n terms .

OR

Find the sum of the series 3 + 33 + 333 + 3333 + … to n terms.

35. The tower of a bridge , hung in the form of a parabola, have their tops 30m above the roadway, and are 200 m apart.. If the cable is 5 m above the roadway at the centre of the bridge, find the length of the vertical supporting cable, 30 m from the centre .

SECTION E

36. There are 10 professors and 20 lecturers out of whom a committee of 2 professors and 3 lecturer is to be formed. Find

(i) In how many ways committee can be formed? **1**
(ii) In how many ways committee can be formed so that particular professor is always included? **1**
(iii) In how many ways committee can be formed so that particular lecturer is always included? **1**
(iv) In how many ways committee can be formed so that particular lecturer is always excluded? **1**

37. If A and B are mutually exclusive events, such that P(A) = 0.35 and P(B) = 0.45, then find

(i) P(A') **1**
(ii) P(A ∪ B) **1**
(iii) P(A ∩ B) **1**
(iv) P(A' ∩ B'). 1

38. The coordinate of the vertices of Δ ABC are A(2, -2) , B(1, -1) and C(-1, 0). Based on the above information find the following:

(i) Slope of line BC **1**
(ii) Slope of line perpendicular to BC . **1**
(iii) Centroid of Δ ABC. **1**
(iv) Equation of line AB. **1**

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