ANNUAL EXAMINATION-2024

CLASS-XI
SUBJECT- MATHEMATICS

Time Allowed: 3hrs **MM: 80**

General Instructions:

1) Question paper consists of five sections Sec-A, Sec-B, Sec-C, Sec-D and Sec-E.

2) All questions are compulsory where as internal choices have been provided

Section- A (one mark question)

1) No. of relation from a set A having 3 elements to another set B having 4 elements will be:

   a) 2^4 b) 2^3 c) 2^{12} d) Empty set

2) $2x + 3y \leq 5$ is a

   a) Strict inequality c) Slack inequality

   b) Normal inequality d)None of the above

3) Which term of sequence $2, 2\sqrt{2}, 4, \ldots$ is 128

   a) 13 b) 30 c) 31 d) None of these

4) Equation of Parabola whose vertex is (0,0) passing through (5,2) and symmetric with respect to y-axis:

   a) $25x^2 = 2y$ b) $2x^2 = 25y$ c) $2x^2 = -25y$ $25x^2 = -2y$

5) Slope of a line which makes an angle of $30°$ with the positive direction of y-axis measured anti-clockwise:

   a) $\sqrt{3}$ b) $-\sqrt{3}$ c) $\sqrt{2}$ d) $-\sqrt{2}$

6) The octant in which point (2, -4, -7) lies

   a) 3rd b) 7th c) 8th d) 5th

7) The value of $\lim_{x\to\frac{\pi}{2}} \tan x$ will be

a) 0 b) ∞ c) Does not exist d) 1

8) Probability that a leap year is not having 53 Sundays is:

a) 2/7 b) 5/7 c) 1/7 d) None of these

9) Variance of first x natural numbers will be:

a) $\frac{(x^2+1)}{2}$ b) $\frac{(x^2+1)}{12}$ c) $\frac{(x^2-1)}{12}$ d) None of these

10) Odds against an event is 5:11 then the probability that the event will happen:

a) 5/11 b) 5/16 c) 6/17 d) None of these

11) For the following data, the mean deviation about median will be:

3, 9, 5, 3, 12, 10, 18, 4, 7, 19, 21

a) 5.27 b) 2.5 c) 5.1 d) None of these

12) 3 vertices of parallelogram ABCD are A(3,-1,2), B(1,2,-4), C(-1,1,2), the coordinate of fourth vertex will be:

a) (1,-2,8) b) (-1,2,8) c) (1,-2,-8) d) (-1,-2,-8)

13) Value of K for which the line $(K-3)x-(4-K^2)y+K^2-3K+6=0$ is passing through origin

a) 6 or 1 b) 1 or 6 c) -6, -1 d) -1, 6

14) Equation of family of lines passing through origin

a) $y=mx+c$ b) $y=kx$ c) $y=c$ d) $x=c$

15) Range of function $F(x)=2-3x$; $x\in R; x>0$ will be

a) (2,∞) b) $(-\infty,2)$ c) $(-\infty,-2)$ d) None of these

16) Solution of inequality $\frac{x}{3}>\frac{x}{2}+1$ will be

a) $(-\infty,-6)$ b) $(-\infty,6)$ c) (6,∞) d) None of these

17) Derivative of function $F(x) = 1 + x + x^2 + \cdots + x^{50}$ at $x = 1$ will be

a) 1200 b) 525 c) 5050 d) None of these

18) Position of point (-2.5, 3.5) with respect to circle $x^2 + y^2 = 25$ will be

a) Inside the circle c) Outside the circle

b) On the circle d) None of these

19) A &B are two events $P(A) = 0.54$, $P(B) = 0.69$ and $P(A \cap B) = 0.35$ then the value of $P(A \cap B)'$ will be

a) 0.19 b) 0.12 c) 0.34 d) 0.88

20) Let A & G be AM and GM of two given positive real numbers a & b, then

a) $A > G$ b) $A \geq G$ c) $A < G$ d) $A \leq G$

Section-B (2 marks each)

21) Find the Domain and range of following real function $f(x) = \sqrt{16 - x^2}$. Show calculation also.

22) Find the equation of circle passing through (2,3) and (-1,1), whose centre is on the line $x - 3y - 11 = 0$.

23) Find the standard deviation of following data:

x_i	3	8	13	18	23
f_i	7	10	15	10	6

24) Evaluate $\lim_{x \to \frac{\pi}{2}} \frac{\tan 2x}{x - \frac{\pi}{2}}$ **OR** $\lim_{x \to 0} \frac{\cos 2x - 1}{\cos x - 1}$.

25) Find the derivative of function $2\sqrt{\sin x^3} + \cos^2 x$ with respect to x.

Section- C (3 marks question)

26) Find the ratio in which the line segment joining the points (4, 8, 10) and (6, 10, -8) is divided by yz-plane.

OR

Using section formula, show that the points A(2, -3, 4), B(-1, 2, 1) and C(0, 1/3, 2) are collinear.

27) Find the derivative of $\sqrt{\sin x}$ by using first principle.

OR

Find the derivative of $\frac{x+1}{x-1}$ by using first principle.

28) Find the image of point (3, 8) with respect to the line $x + 3y = 7$ assuming the line to be a plane mirror.

29) Find the sum of n-terms of sequence $8 + 88 + 888 + \cdots$.

OR

If p^{th}, q^{th} and r^{th} term of a GP are a, b and c respectively. Prove that

$$a^{q-r} * b^{r-p} * c^{p-q} = 1.$$

30) If A and B are 2 events, such that $P(A) = 0.54$, $P(B) = 0.69$ and $P(A \cap B) = 0.35$. Find

a) $P(A \cup B)$ b) $P(B \cap A')$ c) $P(A' \cap B')$

Section – D (5 marks)

31) Solve the following system of inequality graphically

$$3x + 2y \leq 150,$$
$$x + 4y \leq 80,$$
$$x \leq 15,$$
$$x \geq 0; y \geq 0.$$

32) If 4-digit numbers greater than 5000 are randomly formed from the digits 0, 1, 3, 5 and 7. What is the probability of forming a number divisible by 5 when,

a) The digits are repeated.

b) The repetition of digit is not allowed.

33) If a function $f: \mathbb{R} \to \mathbb{R}$ defined by $f(x) = \begin{cases} 2x;\ x > 3 \\ x^2; 3 \geq x > 1 \\ 3x\ ; x \leq 1 \end{cases}$. Calculate

$$f(-1) + f(2) + f(4).$$

34) The mean and standard deviation of 20 observations are found to be 10 & 2. On rechecking, it was found that observation 8 was incorrect. Calculate the correct mean and standard deviation in each of the following cases:

a) If wrong item is omitted. b) If it is replaced by 12.

35) If 'p' be the length of perpendicular from origin to the line whose intercepts on axes are a and b then show that: $\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$.

OR

In ΔABC with vertices A(2, 3), B(4, -1), C(1, 2). Find the equation and the length of altitude from A to BC.

Section- E (4 marks)

CASE STUDY:

36) A person has 2 parents, 4 grandparents, 8 great grand parents. Find: (2+2)

a) Number of his ancestors during the 10 generations preceding his own.

b) What will be the number of ancestor in 6th generation.

37) Ram is standing on the boundary of a circular park whose equation is $(x-3)^2 + (y-5)^2 = 49$. He wants to make another circular park whose area is double the area of this circular path. Find: (1+1+2)

a) Radius of circular park.

b) Circumference of park.

c) Equation of park.

38) Aman, standing in a park which is triangular whose vertices are A(3,-5,7) and B(3,-5,7) asked his friend to stand at a point whose coordinates are (1,1,1) in such a way that it always divides medians in the ratio 2:1 from vertex to base. Calculate: (1+2+1)

a) The coordinate of third vertex.

b) Length of median.

c) Name the point whose coordinates are (1,1,1).