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ANNUAL EXAMINATION (2022-23)
CLASS-XI SUBJECT-MATHEMATICS

TIME : 3 Hrs.

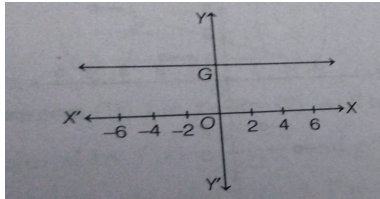
M.M : 80

SECTION -A (1 MARKS each)

- $\frac{\sin \sin x}{\sqrt{x+1} - \sqrt{1-x}}$ equals to:
(a) 2 (b) 0 (c) 1 (d) -1
- Length of latus-rectum of the hyperbola $16x^2 - 9y^2 = 144$ is
(a) $\frac{16}{3}$ (b) $\frac{32}{3}$ (c) $\frac{8}{3}$ (d) $\frac{4}{3}$.
- If $nC_{10} = nC_3$ then n is equal to
(a) 7 (b) 13 (c) 286 (d) 30
- If $\tan^2 45^\circ - \cos^2 30^\circ = x \sin 30^\circ \cos 60^\circ$ then value of x is
(a) 0 (b) 2 (c) 1 (d) -1
- If $f(x) = x^3 - \frac{1}{x^3}$ then $f(x) + f\left(\frac{1}{x}\right)$ is
(a) 0 (b) 3 (c) 1 (d) -1
- While shuffling a pack of 52 playing cards, 2 are accidentally dropped. Find the probability that the missing cards to be of different colours.
(a) $\frac{29}{52}$ (b) $\frac{1}{2}$ (c) $\frac{26}{51}$ (d) $\frac{27}{51}$
- X-axis is the intersection of two planes
(a) XY & XZ (b) YZ & ZX (c) XY & YZ (d) None of these
- Area enclosed by the ellipse is $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is equal to
(a) $\pi^2 ab$ (b) πab (c) $\pi a^2 b$ (d) πab^2
- The ratio in which the line joining (2,4,5) and (3,5,-9) is divided by yz plane is
(a) 2:3 (b) 3:2 (c) -2:3 (d) 4:-3.
- A set $B = \{5\}$ is called
(a) Singleton set (b) empty set (c) infinite set (d) None of these
- 5120 is which term of the G.P. 5,10,20,40,...
(a) 11th (b) 10th (c) 6th (d) 5th.
- If $\frac{(1+i)^2}{2-i} = x + iy$ then the value of $x + y$.

- (a) $\frac{1}{5}$ (b) $\frac{2}{5}$ (c) $\frac{6}{5}$ (d) $\frac{4}{5}$

13. If G represents the name of the function in given graph, then G is a / an



- (a) Identity function (b) constant function (c) modulus function (d) None of these
14. If $y = 3x^3 - 2x^2 + 4x + 1$, then find $\frac{dy}{dx}$ at $x = -1$.
 (a) 0 (b) -22 (c) 17 (d) 13
15. Which term is greater $(1.2)^{4000}$ or 800.
 (a) 800 (b) $(1.2)^{4000}$ (c) both a & b are equal (d) None of these
16. Is Given relation is function? $\{(3, 3), (4, 2), (5, 1), (6, 0), (7, 7)\}$
 (a) yes (b) no (c) cannot say (d) Insufficient data.
17. Let $A = \{a, b, c, d\}$ and $B = \{x, y, z\}$ What is the number of elements in $A \times B$?
 (a) 6 (b) 7 (c) 12 (d) 64
18. If the distance between the points $(a, 0, 1)$ and $(0, 1, 2)$ is $\sqrt{27}$, then the value of a is
 (a) 5 (b) ± 5 (c) -5 (d) None of these.

ASSERTION – REASON BASED QUESTIONS

In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). choose the correct answer out of the following choices

- (a) Both A and R are true and R is correct explanation of A.
 (b) Both A and R are true and R is not correct explanation of A.
 (c) A is true but R is false
 (d) R is true but A is false.
19. **Assertion (A):** The point $(3, 0)$ is at 3 units distance from the Y-axis measured along the positive X-axis and has zero distance from the X-axis.
Reason (R): The point $(3, 0)$ is at 3 units distance from the X-axis measured along the positive Y-axis and has zero distance from the Y-axis.
20. **Assertion (A):** The set of positive integers greater than 100 is infinite.
Reason (R): The set of prime numbers less than 99 is finite.

SECTION – B (2 marks each)

21. Find the distance between the lines $15x + 8y - 34 = 0$ & $15x + 8y + 31 = 0$

OR

Reduce the equation $2x - 3y + 5 = 0$ into intercept form and find their intercept on the axes.

22. If $\left(\frac{1+i}{1-i}\right)^m = 1$, then find the least positive integral value of m.

OR

Let $U = \{1,2,3,4,5,6,7,8,9\}$, $A = \{2,4,6,8\}$, $B = \{2,3,5,7\}$. Verify $(A \cup B)^c = A^c \cap B^c$.

23. Find modulus and argument of $\frac{1+i}{2+i}$.

24. Find centre and radius of the circle $3x^2 + 3y^2 - 6x - 9y - 12 = 0$.

25. Find the value of $\sin x$ and $\cos x$ if $\tan x = -\frac{5}{12}$, x lies in second quadrant

SECTION – C (3 marks each)

26. Solve: $\frac{3(x-2)}{5} \leq \frac{5(2-x)}{3}$ the inequality.

27. Find the term independent of x in the expansion of $\left(3x - \frac{2}{x^2}\right)^{15}$.

28. Find the equation of circle passing through $(2,-1)$, $(2,3)$, $(4,-1)$.

OR

Find the ratio in which the line segment joining the point $(2,-1,3)$ and $(-1,2,1)$ is divided by the plane $x + y + z = 5$.

29. Find 'n' if $n - {}^1P_3 : nP_4 = 1 : 9$.

OR

A bag contains 5 black and 6 red balls determine the number of ways in which 2 black and 3 red balls can be selected.

30. Using first principle, find the derivative of $\tan x$.

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

OR

Find the equation of line passing through the point $(2,2)$ and cutting off intercepts on the axes

SECTION – D (5 marks each)

32. If $y = \sqrt{\frac{x}{a}} + \sqrt{\frac{a}{x}}$, Prove that $2xy \frac{dy}{dx} = \frac{x}{a} - \frac{a}{x}$.

33. Prove that $\cos^2 x + \cos^2\left(x + \frac{\pi}{3}\right) + \cos^2\left(x - \frac{\pi}{3}\right) = \frac{3}{2}$.

OR

If $\tan x + \tan y = a$ and $\cot y + \cot x = b$ Prove that $\frac{1}{a} - \frac{1}{b} = \cot \cot (x + y)$

34. The sum of two numbers is 6 times their geometric mean, show that numbers are in ratio $(3 + 2\sqrt{2}) : (3 - 2\sqrt{2})$.

OR

If the first and n^{th} term of a G.P. are 'a' & 'b' respectively and if P is the product of n terms Prove that $P^2 = (ab)^n$.

35. Calculate 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

SECTION –E(case study)(4 marks each)

36. In an University, out of 100 students 15 students offered Mathematics only, 12 students offered Statistics only, 8 students offered only Physics, 40 students offered Physics and Mathematics, 20 students offered Physics and Statistics, 10 students offered Mathematics and Statistics, 65 students offered Physics.

Based on the above information answer the following questions:

- (i) Find the number of students who offered all the three subjects.
- (ii) Find the number of students who offered Mathematics.
- (iii) Find the number of students who offered statistics.

OR

Find the number of students who offered mathematics and statistics but not physics.

37. Varun, Abhay and Rohit were doing shooting. Varun hits the target 4 times in 5 shots, Abhay hits the target 3 times in 4 shots and Rohit hits the target 2 times in 3 shots. Now on the Basis of this information answer the following questions:

- (i) What is the probability that Varun, Abhay and Rohit all may hit the target.
- (ii) What is the probability that none of them will hit the target .
- (iii) What is the probability that Abhay and Rohit may hit but Varun may not hit.

OR

What is the probability that any two among Varun, Abhay and Rohit may hit the target.

38. Four friends Rishabh, Shubham, Vikram and Rajkumar are sitting on vertices of a rectangle, whose coordinates are given. Based on the above information answer the following questions.

- (i) Find the equation formed by Shubham and Rajkumar.
- (ii) Find the equation formed by Rishabh and Vikram.
- (iii) Find the intersection point of above two equations.

OR

Find the Slope of equation of line formed by Rishabh and Rajkumar.
