INDIAN SCHOOL SOHAR
PRE BOARD EXAMINATION (2019-20)
MATHEMATICS

CLASS: XII **MAX. MARKS: 80**
DATE: 11/01/2020 **DURATION: 3 HOURS**

General Instructions:

a) All the questions are compulsory.
b) The question paper consists of 36 questions divided into 4 sections A, B, C, and D.
c) Section A comprises of 20 questions of 1 mark each. Section B comprises of 6 questions of 2 marks each.
d) Section C comprises of 6 questions of 4marks each. Section D comprises of 4 questions of 6 marks each.
e) There is no overall choice. However, an internal choice has been provided in three questions of 1 mark each, two questions of 2 marks each, two questions of 4 marks each, and two questions of 6 marks each. You have to attempt only one of the alternatives in all such questions.
f) Use of calculators is not permitted.

SECTION – A

1. If A and B are invertible matrices, then which of the following is not correct?

   a) adj A = |A|. A^{-1} b) $\det(A)^{-1} = [\det(A)]^{-1}$ c) $(AB)^{-1} = B^{-1}A^{-1}$ d) $(A + B)^{-1} = B^{-1} + A^{-1}$

2. If A and B are symmetric matrices of the same order, then (AB′ –BA′) is a

   a) Skew symmetric matrix b) Null matrix c) Symmetric matrix d) None of these

3. If $\vec{a}$ and $\vec{b}$ are unit vectors , then what is the angle between $\vec{a}$ and $\vec{b}$ for $\sqrt{3}\vec{a} - \vec{b}$ to be a unit vector

   a) $\frac{\pi}{6}$ b) $\frac{5\pi}{6}$ c) $-\frac{\pi}{6}$ d) $\frac{\pi}{3}$

4. If two events are independent, then

   a) They must be mutually exclusive b) The sum of their probabilities must be equal to 1 c) (a) and (b) both are correct d) None of the these is correct

5. If A and B are independent events such that 0 < P (A) < 1 and n 0 < P (B) < 1, then which of the following is not correct?

   a) A and B are mutually exclusive B) A and B′ are independent C) A′ and B are independent D) A′ and B′ are independent

6. The value of $\sin^{-1}\left(\cos\left(\frac{43\pi}{15}\right)\right)$ is

   a) $\frac{3\pi}{5}$ b) $-\frac{7\pi}{5}$ c) $\frac{\pi}{10}$ d) $-\frac{\pi}{10}$

7. Let A and B be two events such that P (A) = 0.6, P (B) = 0.2, and P (A | B) = 0.5. Then P (A′ | B′) equals

a) $\frac{1}{10}$ b) $\frac{3}{10}$ c) $\frac{3}{8}$ d) $\frac{6}{7}$

8. The function f (x) = |x| + |x – 1| is

a) Continuous at x = 0 as well as at x = 1.

b) Continuous at x = 1 but not at x = 0.

c) Discontinuous at x = 0 as well as at x = 1.

d) Continuous at x = 0 but not at x = 1.

9. The plane 2x – 3y + 6z – 11 = 0 makes an angle $\sin^{-1}(\alpha)$ with x-axis. The value of α is equal to

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

10. If the line drawn from the point (–2, – 1, – 3) meets a plane at right angle at the point (1, – 3, 3), find the equation of the plane.

a) 3x – 2y +6z + 27 = 0 b) 3x – 2y +6z - 27 = 0 c) 3x + 2y +6z + 27 = 0 d) 3x – 2y -6z + 27 = 0

11. The vector of magnitude $10\sqrt{3}$ perpendicular to the plane containing the vectors $\vec{a} = \hat{i} + 2\hat{j} + \hat{k}$ and $\vec{b} = -\hat{i} + 3\hat{j} + 4\hat{k}$ is ________________________

12. If $\begin{bmatrix} 2x & 3 \end{bmatrix}\begin{bmatrix} 1 & 2 \\ -3 & 0 \end{bmatrix}\begin{bmatrix} x \\ 8 \end{bmatrix} = 0$, The value 'x' is __________________

13. Differentiation of f(x) = $\frac{8^x}{x^8}$ with respect to 'x' is ______________________

14. If $f(x) = \frac{1}{4x^2 + 2x + 1}$ then its maximum value is ____________________

15. Given f(x) = $\frac{1}{x-1}$ .The points of discontinuity of the composite function y = f [f(x)] is ____________

OR

Differentiation of $\sqrt{\tan\sqrt{x}}$ with respect to ' x ' is _____________________

16. Evaluate $\begin{vmatrix} \sqrt{23}+\sqrt{3} & \sqrt{5} & \sqrt{5} \\ \sqrt{15}+\sqrt{46} & 5 & \sqrt{10} \\ 3+\sqrt{115} & \sqrt{15} & 5 \end{vmatrix}$

17. Evaluate $\int \sqrt{10 - 4x + x^2})\, dx$

18. Evaluate $\int \frac{3ax}{b^2 + c^2x^2}\, dx$

19. Evaluate $\int_{2}^{8} \frac{\sqrt{10-x}}{\sqrt{x}+\sqrt{10-x}}\, dx$

20. What is the order of the differential equation of all circles of given radius a? Why?

SECTION - B

21. Is g = {(1, 1), (2, 3), (3, 5), (4, 7)} a function? If g is described by $g(x) = \alpha x + \beta$, then what value should be assigned to α and β.

22. Using mean value theorem, prove that there is a point on the curve $y = 2x^2 - 5x + 3$ between the points A(1, 0) and B (2, 1), where tangent is parallel to the chord AB. Also, find that point.

23. Using differentials, find the approximate value of $\sqrt{0.082}$

24. Prove that the lines x = py + q, z = ry + s and x = p'y + q', z = r'y + s' are perpendicular if pp' + rr' + 1 = 0.

25. If $\vec{a}$ and $\vec{b}$ are the unit vectors inclined at angle θ then prove that $\tan\frac{\theta}{2} = \frac{\left|\vec{a}-\vec{b}\right|}{\left|\vec{a}+\vec{b}\right|}$

OR

Prove Cauchy Schawarz inequality $\left|\vec{a}\cdot\vec{b}\right| \le \left|\vec{a}\right| \cdot \left|\vec{b}\right|$

26. A committee of 4 students is selected at random from a group consisting 8 boys and 4 girls. Given that there is at least one girl on the committee, calculate the probability that there are exactly 2 girls on the committee.

OR

A and B are two candidates seeking admission in a college. The probability that A is selected is 0.7 and the probability that exactly one of them is selected is 0.6. Find the probability that B is selected.

SECTION - C

27. Let $f, g : \mathbf{R} \rightarrow \mathbf{R}$ be two functions defined as $f(x) = |x| + x$ and $g(x) = |x| - x$ $\forall x \in \mathbf{R}$. Then, find $f \circ g$ and $g \circ f$.

28. If x sin (a + y) + sin a cos (a + y) = 0, Prove that $\frac{dy}{dx} = \frac{\sin^2(a+y)}{\sin a}$

29. Find the general solution of (1 + tany) (dx – dy) + 2xdy = 0.

OR

Find the equation of a curve passing through the point (1, 1). If the tangent drawn at any point P (x, y) on the curve meets the co-ordinate axes at A and B such that P is the mid-point of AB.

30. Evaluate $\int_{0}^{1} x\left(\tan^{-1} x\right)^{2} dx$

OR

Evaluate $\int \frac{x^2}{x^4 + x^2 - 2} dx$

31. Determine variance and standard deviation of the number of heads in three tosses of a coin.

32. A manufacturing company makes two types of television sets; one is black and white and the other is colour. The company has resources to make at most 300 sets a week. It takes Rs 1800 to make a black and white set and Rs 2700 to make a coloured set. The company can spend not more than Rs 648000 a week to make television sets. If it makes a profit of Rs 510 per black and white set and Rs 675 per coloured set, how many sets of each type should be produced so that the company has maximum profit?.Solve by LPP

SECTION - D

33. In triangle ABC ,if show that $\begin{vmatrix} 1 & 1 & 1 \\ 1+\sin A & 1+\sin B & 1+\sin C \\ \sin A+\sin^2 A & \sin B+\sin^2 B & \sin C+\sin^2 C \end{vmatrix} = 0$

Prove that the triangle ABC is isoceles

34. Find the area of the region bounded by the curve $y^2 = 2x$ and $x^2 + y^2 = 4x$.

OR

Draw a rough sketch of the given curve y = 1 + |x +1|, x = –3, x = 3, y = 0 and find the area of the region bounded by them, using integration.

35. A telephone company in a town has 500 subscribers on its list and collects fixed charges of Rs 300/- per subscriber per year. The company proposes to increase the annual subscription and it is believed that for every increase of Re 1/- one subscriber will discontinue the service. Find what increase will bring maximum profit?

36. Find the image of the point (1, 6, 3) in the line $\frac{x}{1} = \frac{y-1}{2} = \frac{z-2}{3}$.

OR

The plane ax + by = 0 is rotated about its line of intersection with the plane z = 0 through an angle α. Prove that the equation of the plane in its new position is ax + by $\pm\left(\sqrt{a^2+b^2}\ \tan\alpha\right)z = 0$

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