

BHARATIYA VIDYA BHAVAN, KOCHI

ANNUAL EXAMINATION 2019- 20

MATHEMATICS

STD XI

TIME : 3HRS

MAX MARK : 80

GENERAL INSTRUCTIONS

1. All the questions are compulsory
2. The question paper consists of 36 questions divided into 4 sections A, B, C and D.
3. Section A comprises of 20 questions of 1 mark each. Section B comprises of 6 questions of 2 marks each. Section C comprises of 6 questions of 4 marks each. Section D comprises of 4 questions of 6 marks each.
4. There is no overall choice. However a internal choice has been provided in 3 questions of 1 mark each, 2 questions of 2 marks each, 2 questions of 4 marks each and 2 questions of 6 marks each. You have to attempt only one of the alternatives in all such questions.
5. Use of calculators is not permitted.

SECTION A

1. The centre of the circle $2x^2 + 2y^2 - x = 0$
(a) $(0, 0)$ (b) $(2, 0)$ (c) $(1/2, 0)$ (d) $(1/4, 0)$
2. The coordinates of the focus of the parabola $3x^2 = -4y$
(a) $(0, -2)$ (b) $(0, 2)$ (c) $(0, 1/3)$ (d) $(0, -1/3)$
3. The number of proper subsets of a set with 5 elements is

(a) 32 (b) 31 (c) 25 (d) 24

4. $\lim_{x \rightarrow 0} \frac{\tan^2 3x}{x^2}$

(a) $\frac{1}{9}$ (b) 9 (c) 3 (d) $\frac{1}{3}$

5. $\lim_{x \rightarrow -1} \frac{x^3 + 1}{x + 1}$ is

(a) 0 (b) 1 (c) 3 (d) 4

6. Name the octant in which (2, -5, -7) lie

(a) XOYZ (b) XOYZ (c) XOYZ (d) XOYZ

7. The centroid of a triangle with vertices (1, 2, -3), (3, 0, 1) and (-1, 1, -4) is

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

8. Two dice are thrown together. The probability that atleast one will show its digits greater than 3

(a) $\frac{1}{4}$ (b) $\frac{3}{4}$ (c) $\frac{1}{2}$ (d) $\frac{1}{8}$

9. The value of $\cos 1^\circ \cos 2^\circ \cos 3^\circ \dots \cos 179^\circ$ is

(a) $\frac{1}{\sqrt{2}}$ (b) 0 (c) 1 (d) -1

10. The sum of n terms of an AP is $3n^2 - n$ and its common difference is 6. Its first term is

(a) 2 (b) 3 (c) 1 (d) 4

11. The coordinates of the point which divides the join of P(2, -1, 4) and Q(4, 3, 2) in the ratio 2:3 externally is

12. $\frac{d}{dx}(e^{ax+b})$ is

13. The length of major axis of the ellipse $9x^2 + 4y^2 = 36$ is

OR

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

14. A bag contains 3 red, 4 white and 5 blue balls. Two balls are drawn at random. What is the probability that they are of different colours.

15. Find the radius of the circle whose arc of length 15π cm makes an angle of $\frac{3\pi}{4}$ radians at the centre

16. Find k such that $k+9$, $k-6$ and 4 form three consecutive terms of a GP.

OR

Evaluate $\sum_{k=1}^{11} (2 + 3^k)$

17. The range of the function $F(x) = -|x|$ is -----

OR

If $A = \{-1, 1\}$ find $A \times A \times A$

18. The argument of $Z = -1 - i\sqrt{3}$ is -----

19. Find the 4th term from the end in the expansion of $(x + \frac{1}{x})^{12}$

20. Write the contrapositive of the following statement

If a triangle is equilateral, it is isosceles.

SECTION B

21. Find the equation of the parabola with vertex $(0, 0)$ passing through $(5, 2)$ and symmetric with respect to y axis.

22. Show that the points $(-2, 3, 5)$, $(1, 2, 3)$ and $(7, 0, -1)$ are collinear.

23. Evaluate $\lim_{x \rightarrow 0} \frac{1 - \cos x}{x^2}$

OR

Evaluate $\lim_{x \rightarrow 0} \frac{\tan 2x + x}{x \cos x + \sin 3x}$

24. Write the sample space for the experiment: A coin is tossed and then a dice rolled only in case a head is shown on the coin

25. Prove that $\sin^2 \frac{\pi}{6} + \cos^2 \frac{\pi}{3} - \tan^2 \frac{\pi}{4} = -\frac{1}{2}$

OR

Prove that $2\sin^2 \frac{\pi}{6} + \operatorname{cosec}^2 \frac{7\pi}{6} \cos^2 \frac{\pi}{3} = \frac{3}{2}$

26. Solve the inequality

$$4x+3 < 5x+7$$

SECTION C

27. Find the coordinates of the foci, vertices, the eccentricity and the length of the latus rectum of the hyperbola $5y^2 - 9x^2 = 36$

OR

Find the equation of the circle passing through the points (4,1) and (6,5) and whose centre is on the line $4x + y = 16$.

28. Evaluate $\lim_{x \rightarrow \pi/4} \frac{\sin x - \cos x}{x - \pi/4}$

OR

Find the derivative of $y = \sqrt{\sin x}$ using first principle.

29. Find $\frac{dy}{dx}$

(1) $y = \frac{\sec x - 1}{\sec x + 1}$

(2) $y = x \sin x \log x$

30. A point R with x coordinate 4 lies on the line segment joining the points P(2,-3, 4) and Q(8,0,10). Find coordinates of the point R.
31. Find the mean deviation about the mean for the following data.

Marks obtained	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80
No of students	2	3	8	14	8	3	2

32. (1) How many different words can be formed with the letters of the word HARYANA?

(2) How many of these begin with H and end with N?

(3) In how many of these H and N are together?

SECTION D

33. Evaluate

$$\lim_{y \rightarrow 0} \frac{(x+y) \sec(x+y) - x \sec x}{y}$$

OR

Evaluate

$$(1) \lim_{x \rightarrow \frac{\pi}{2}} \frac{1 + \sec^3 x}{\tan x}$$

$$(2) \lim_{x \rightarrow 0} \frac{x}{\sqrt{a+x} - \sqrt{a-x}}$$

34. A letter is chosen at random from the word ASSASSINATION. Find the probability that letter is

(1) a vowel

(2) a consonant

OR

If E and F are events such that $P(E) = \frac{1}{4}$, $P(F) = \frac{1}{2}$ and $P(E \text{ and } F) = \frac{1}{8}$

Find (1) $P(E \text{ or } F)$ (2) $P(\text{not } E \text{ and not } F)$

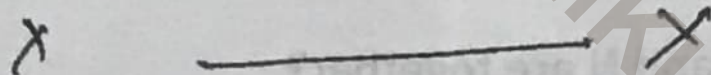
35. Prove by using the principle of mathematical induction

$x^{2n} - y^{2n}$ is divisible by $x + y$.

OR

Prove that $1.2.3 + 2.3.4 + \dots + n(n+1)(n+2) = \frac{n(n+1)(n+2)(n+3)}{4}$

36. If p and q are the lengths of perpendiculars from the origin to the lines $x \cos \theta - y \sin \theta = k$ and $x \sec \theta + y \operatorname{cosec} \theta = k$ respectively, prove that $p^2 + 4q^2 = k^2$



BHARATIYA VIDYA BHAVAN, KOCHI
SECOND TERMINAL EXAMINATION 2019 -2020

MATHEMATICS

STD : XI

TIME: 3 hrs

MAX MARK:80

GENERAL INSTRUCTIONS

1. All the questions are compulsory
2. The question paper consists of 36 questions divided into 4 sections A, B,C and D.
3. Section A comprises of 20 questions of 1 mark each. Section B comprises of 6 questions of 2 marks each. Section C comprises of 6 questions of 4 marks each. Section D comprises of 4 questions of 6 marks each.
4. There is no overall choice. However, an internal choice has been provided in 3 questions of 1 mark each, 2 questions of 2 marks each, 2 questions of 4 marks each and 2 questions of 6 marks each. You have to attempt only one of the alternatives in all such questions.
5. Use of calculators is not permitted.

SECTION A

1. The value of $(1+i)(1+i^2)(1+i^3)(1+i^4)$ is
(a) 2 (b) 0 (c) 1 (d) i
2. The principal value of the amplitude of $(1+i)$ is
(a) $\frac{\pi}{4}$ (b) $\frac{\pi}{12}$ (c) $\frac{3\pi}{4}$ (d) π
3. If ${}^nC_8 = {}^nC_7$ then $n =$ -----
(a) 1 (b) 56 (c) 15 (d) 9
4. The total number of words formed by 2 vowels and 3 consonants is equals to
(a) 60 (b) 120 (c) 7200 (d) none of these

OR

In how many ways three different rings can be worn in four fingers with atmost 1 in each finger

- (a) 12 (b) 6 (c) 4 (d) 24

5. Find the positive value of m for which the coefficient of x^2 in the expansion of

$$(1+x)^m = 6$$

- (a) 3 (b) 6 (c) 4 (d) 2

6. ${}^5C_1 + {}^5C_2 + {}^5C_3 + {}^5C_4 + {}^5C_5 =$
 (a) 30 (b) 31 (c) 32 (d) 33
- 7 The coefficient of x^8y^{10} in the expansion of $(x+y)^{18}$ is -----
 (a) ${}^{18}C_{10}$ (b) ${}^{18}C_8$ (c) ${}^{18}C_9$ (d) 2^{18}
- 8 The total number of ways of answering 5 objective type questions , each question having 4 choices
 (a) 4^5 (b) 5^4 (c) 4×5 (d) none of these
- 9 The angle between the lines $2x - y + 3 = 0$ and $x + 2y + 3 = 0$ is
 (a) 90° (b) 60° (c) 45° (d) 30°
- 10 The area of the triangle with vertices $(-4, -1)$, $(1, 2)$ and $(4, -3)$ is
 (a) 17 (b) 16 (c) 15 (d) none of these
- 11 Find the multiplicative inverse of $(3+4i)$
- 12 If $Z_1 = 2-iy$ and $Z_2 = x+3i$ are equal find x & y
- 13 Find the sum of series $5 + 13 + 21 + \dots + 181$
- 14 Find the 6th term of the GP 1, 4, 16, 64, -----
- 15 If a, b, c are in GP and $a^{1/x} = b^{1/y} = c^{1/z}$, then x, y, z are in -----
- 16 Find the constant term in the expansion of $(x - \frac{1}{x})^{10}$
- 17 Find the fourth term from the end in the expansion of $(\frac{3}{x^2} - \frac{x^3}{6})^7$

OR

What is the maximum number of points of intersection of 8 straight lines in a plane.

- 18 Two vertices of a triangle are $(3, -5)$ and $(-7, 4)$. Centroid is $(2, -1)$ find the third vertex

19 Find k if $(k, 2-2k), (-k+1, 2k), (-4-k, 6-2k)$ are collinear

20 Find λ if $2x - 3y + 6 = 0$ and $4x + \lambda y + 15 = 0$ are parallel.

SECTION B

21 Solve $-3 \leq 4 - \frac{7x}{2} \leq 18$

22 Find the sum to n terms of an AP whose k^{th} term is $5k + 1$

23 Find the term independent of x in the expansion of $(\frac{3x^2}{2} - \frac{1}{3x})^6$

24 If the coefficients of $(r-5)^{\text{th}}$ and $(2r-1)^{\text{th}}$ terms in the expansion of $(1+x)^{34}$ are equal. Find r .

OR

Evaluate $(\sqrt{3} + \sqrt{2})^6 - (\sqrt{3} - \sqrt{2})^6$

25 Find n if ${}^nP_5 = 42 {}^nP_3$

OR

How many words with or without meaning can be formed using all the letters of the word EQUATION. How many of these start with a vowel.

26 How many diagonals are there in a polygon with 10 sides

SECTION C

27 If $(x+iy)^3 = u + iv$, then show that $\frac{u}{x} + \frac{v}{y} = 4(x^2 - y^2)$

OR

Convert $(\frac{1+2i}{1-3i})$ in the polar form

28 A group consists of 4 girls and 7 boys. In how many ways can a team of 5 members be selected if the team has (1) no girl (2) atleast one boy and one girl (3) atleast 3 girls.

29 How many even numbers are there with 3 digits such that if 5 is one of the digits, then 7 is the next digit.

30 Find a, b and n if the first three terms in the expansion of $(a+b)^n$ are 729, 7290 and 30375 respectively.

OR

Show that the coefficient of the middle term in the expansion of $(1+x)^{2n}$ is equal to the sum of coefficients of two middle terms in the expansion of $(1+x)^{2n-1}$

31 The sum of 3 numbers in GP is 56. If we subtract 1, 7, 21 from these numbers in that order we obtain an AP. Find the numbers

- 32 Find the equation of the line passing through the point (2,2) and cutting off intercepts on the axes whose sum is 9.

SECTION D

- 33 Solve the system of linear inequations graphically
 $x+y \leq 5$, $4x+y \geq 4$, $x+5y \geq 5$, $x \leq 4$, $y \leq 3$

- 34 Express in standard form $\left(\frac{1}{1-4i} - \frac{2}{1+i}\right)\left(\frac{3-4i}{5+i}\right)$

- 35 Find the sum to n terms of the series

$$1^2 + (1^2 + 2^2) + (1^2 + 2^2 + 3^2) + \dots$$

OR

$$\frac{1^3}{1} + \frac{1^2+2^3}{1+3} + \frac{1^2+2^3+3^3}{1+3+5} + \dots$$

- 36 Find the circumcentre of triangle with sides $3x - y + 3 = 0$, $3x + 4y + 3 = 0$ and $x + 3y + 11 = 0$

OR

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

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BHARATIYA VIDYA BHAVAN, KOCHI

SECOND UNIT TEST (2019-2020)

MATHEMATICS

STD XI

Marks: 25

Time: 80 minutes

Choose the correct answer for question no. 1 to 5

1. The solution of the inequality $3x + 8 > 2$ when $x \in \mathbb{R}$ is:
 (a) $\{-2, -1, 0, \dots\}$ (b) $\{\dots, -3, -2\}$ (c) $(-2, \infty)$ (d) $(-\infty, -2)$
2. $\sqrt{-16} \times \sqrt{-49} =$
 (a) 28 (b) -28 (c) 28i (d) -28i
3. Modulus of the complex number $3 + 7i$ is:
 (a) $\sqrt{29}$ (b) $2\sqrt{29}$ (c) $4\sqrt{29}$ (d) $\sqrt{58}$
4. If $k + 2, 4k - 6, 3k - 2$ are in A.P., then the value of k is:
 (a) 3 (b) -3 (c) 2 (d) -1
5. The sum to infinity of the G.P. $5, \frac{20}{7}, \frac{80}{49}, \dots$ is:
 (a) $\frac{7}{3}$ (b) $\frac{35}{3}$ (c) $\frac{28}{3}$ (d) $\frac{3}{35}$

[5 x 1 = 5]

6. Represent $4\sqrt{3} + 4i$ in polar form.
7. If the sum of a certain number of terms of the A.P. 25, 22, 19, ... is 116, find the last term.
8. The A.M. between two positive numbers is 34 and their G.M. is 16. Find the numbers.

OR

Insert three geometric means between 1 and 256.

[3 x 2 = 6]

9. Find the square root of $-15 - 8i$.
10. Find the sum of the series $1.2.3 + 2.3.4 + 3.4.5 + \dots$ to n terms.

[2 x 4 = 8]

11. Graphically solve the system of linear inequalities:

$$x - 2y \leq 3, 3x + 4y \geq 12, x \geq 0, y \geq 1.$$

OR

- (i) Solve and represent on the number line.

$$\frac{x}{4} \leq \frac{5x-2}{3} - \frac{7x-3}{5}$$

- (ii) The longest side of a triangle is twice the shortest side and the third side is 3 cm longer than the shortest side. If the perimeter of the triangle is at least 39cm, find the minimum length of the longest side.

[1 x 6 = 6]

BHARATIYA VIDYA BHAVAN, KOCHI

FIRST UNIT TEST, 2019 -20

MATHEMATICS

STD : XI

Max. Marks: 25

Time : 80 min

1. Write $\{0, 3, 8, 15, 24, 35\}$ in set builder form.
2. Let $A = \{1, 2, 3\}$ $B = \{3, 4\}$ and $C = \{4, 5, 6\}$. Find $A \times (B \cap C)$.
3. If $\sin x = \frac{3}{5}$, x lies in the second quadrant, find the value of $\cos x$.
4. Let $f: \mathbb{R} \rightarrow \mathbb{R}$ be a function defined by $f(x) = [x] - |2x| + 4$, $x \in \mathbb{R}$. Find $f(-3.2)$. (4X1=4)
5. Using properties of sets, prove that $A - (A - B) = A \cap B$.
6. Let $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$ $A = \{1, 2, 3, 4\}$ $B = \{2, 4, 6, 8\}$ and $C = \{3, 4, 5, 6\}$.
Find (a) $A \cap (B \cup C)$ (b) $A - (B - C)$.
7. The radius of a circle is 30 cm. Find the length of an arc of this circle, if the length of the chord of the arc is 30 cm.
8. Let $A = \{1, 2, 3, 4, 5, 6\}$. Define a relation R from A to A by $R = \{(x, y): y = x + 1\}$.
(a) Write R in roster form. (b) Write down the domain and range of R . (4x2=8)
9. Prove that $\sin 2x + 2\sin 4x + \sin 6x = 4 \cos^2 x \sin 4x$.
10. Find the domain and range of the real function f defined by $f(x) = \sqrt{x - 2}$.
11. Prove that $\cos\left(\frac{3\pi}{2} + x\right) \cos(2\pi + x) \left[\cot\left(\frac{3\pi}{2} - x\right) + \cot(2\pi + x)\right] = 1$ (3x3=9)
12. In a class, 18 students offered Physics, 23 offered Chemistry and 24 offered Mathematics. Of these, 13 are in both Chemistry and Mathematics, 12 in Physics and Chemistry, 11 in Mathematics and Physics, and 6 in all the three subjects. Find
(a) How many students are there in the class?
(b) How many offered Mathematics but not Chemistry?
(c) How many are taking exactly one of the three subjects? (4x1=4)

BHARATIYA VIDYA BHAVAN, KOCHI
ANNUAL EXAMINATION 2018-2019

Std XI

MATHEMATICS

Time : 3 hrs

Marks : 100

Instructions:

- a) All questions are compulsory.
- b) The question paper consists of 29 questions.
- c) Questions 1 – 4 in Section A are very short-answer type questions carrying 1 mark each.
- d) Questions 5 – 12 in Section B are short-answer type questions carrying 2 marks each.
- e) Questions 13 – 23 in Section C are long-answer type questions carrying 4 marks each.
- f) Questions 24 – 29 in Section D are long-answer type questions carrying 6 marks each.

SECTION A

1. If $R = \{ (x,y): x,y \in Z, x^2 + y^2 \leq 4 \}$ is a relation on Z , then write the domain of R
2. Write the contrapositive of the statement "If she works, she will earn money"
3. Find the latus rectum of the hyperbola $25x^2 - 36y^2 = 225$

OR

Find the eccentricity of an ellipse whose latus rectum is one half of its minor axis

4. Let A and B be two mutually exclusive events of a random experiment such that $P(\text{not } A) = 0.65$ and $P(A \cup B) = 0.65$, find $P(B)$

SECTION B

5. Let $f = \{ (1,1), (2,3), (0,-1), (-1,-3) \}$ be a linear function from Z to Z . Find $f(x)$

6. Using properties of sets prove that for any two sets A and B ,

$$A \cup (B - A) = A \cup B$$

$$A \cup (B \cap A') = A \cup B \quad \text{OR} \quad A \cup A'$$

Let U be the universal set containing 700 elements. If A and B are subsets of U such that $n(A) = 200$, $n(B) = 300$ and $n(A \cap B) = 100$, then find $n(A' \cap B')$

7. Solve $\frac{5-2x}{3} \leq \frac{x}{6} - 5$ and represent the solution on a number line

8. Find the general solution for $\sec^2 2x = 1 - \tan 2x$

OR

$$\text{Prove that } 2\sin^2 \frac{\pi}{6} + \operatorname{cosec}^2 \frac{7\pi}{6} \cos^2 \frac{\pi}{3} = \frac{3}{2}$$

9. Find the equation of the hyperbola, with foci $(0, \pm 3)$ and vertices

$$(0, \pm \frac{\sqrt{11}}{2})$$

10. For what value of p , does $\lim_{x \rightarrow 1} f(x)$ exists if,

$$f(x) = \begin{cases} 2px + 3 & \text{if } x \leq 1 \\ 1 - px^2 & \text{if } x > 1 \end{cases}$$

11. Find the coefficient of $x^6 y^3$ in the expansion of $(x + 2y)^9$

12. If origin is the centroid of the triangle PQR with vertices $P(2a, 2, 6)$, $Q(-4, 3b, -10)$ and $R(8, 14, 2c)$, then find the values of a, b and c

OR

Check whether the four points $A(1, 2, 3)$, $B(-1, -2, -1)$, $C(2, 3, 2)$ and $D(4, 7, 6)$ taken in order, form the vertices of a rectangle or not

SECTION C

13. Prove by using the principle of mathematical induction for all $n \in \mathbb{N}$, $3^{2n+2} - 8n - 9$ is divisible by 8

OR

Prove by mathematical induction for all $n \in \mathbb{N}$,

$$\frac{1}{3.5} + \frac{1}{5.7} + \frac{1}{7.9} + \dots + \frac{1}{(2n+1)(2n+3)} = \frac{n}{3(2n+3)}$$

14. Each student in a class of 40, studies at least one of the subjects English, Mathematics and Economics. 16 study English, 22 Economics and 26 Mathematics, 5 study English and Economics, 14 Mathematics and Economics and 2 English, Economics and Mathematics. Find the number of students who study:
- (1) English and Mathematics
 - (2) English, Mathematics but not Economics

15. Find the square root of $-15 - 8i$

16. Calculate the mean and variance for the following frequency distribution:

Classes	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50
Frequencies	5	8	15	16	6

17. Find four numbers forming a GP where the third term is greater than the first by 9 and the second term is greater than the fourth by 18

18. Find the middle terms in the expansion of $(3 - \frac{x^3}{6})^7$

OR

Find 'a', if the 17th and 18th terms of the expansion $(2 + a)^{50}$ are equal

19. Determine the point in XY plane which is equidistant from three points A (2,0,3), B (0,3,2) and C (0,0,1)

OR

Find the equation of the set of points P, the sum of whose distances from A (4,0,0) and B (-4,0,0) is equal to 10

20. An urn contains 8 red, 3 white and 9 blue balls. If three balls are drawn at random, determine the probability that:

- (1) none of the balls drawn is white
- (2) one of each colour is drawn

21. Find the points which trisect the line joining the points (1,4,7) and (4,1,4)

22. Find the derivatives of the given functions with respect to x

(1) $\operatorname{cosec} x \cot x$

(2) $(x + \frac{1}{x})(x^2 - \frac{1}{x^2})$

23. In a class, there are 10 boys and 8 girls. A committee of 3 students is constituted. What is the probability that the committee has

- (1) all girls
- (2) 1 boy and 2 girls
- (3) atleast one girl

SECTION D

24. Solve the following inequalities graphically:

$$x + 2y \leq 10, x + y \geq 1, x - y \leq 0, x \geq 0, y \geq 0$$

25. (1) Find the number of 8 letter arrangements that can be made from the letters of the word DAUGHTER so that all vowels do not occur together

(2) In how many ways can one select a cricket team of eleven from 17 players in which only 5 players can bowl if each cricket team of 11 must include exactly 4 bowlers

OR

(1) How many 6 digit numbers can be formed from the digits 0,1,3,5,7 and 9 which are divisible by 10 and no digit is repeated

(2) In how many ways can 5 girls and 3 boys be seated in a row so that no two boys are together

26. Find the equation of the line passing through the point of intersection of the lines $4x + 7y - 3 = 0$ and $2x - 3y + 1 = 0$, and having equal intercepts on the axes

OR

Find the image of the point $(-8, 12)$ with respect to the line $4x + 7y + 13 = 0$ assuming the line to be a plane mirror

27. If the 6th, 7th and 8th term in the expansion of $(x + a)^n$ are respectively 112, 7 and $\frac{1}{4}$, find x , a and n

OR

The coefficients of the $(r-1)^{\text{th}}$, r^{th} and $(r+1)^{\text{th}}$ terms in the expansion of $(x + 1)^n$ are in the ratio 1 : 3 : 5. Find n and r

28. Evaluate

(1) $\lim_{x \rightarrow 0} \frac{\cos 2x - 1}{\cos x - 1}$

(2) $\lim_{x \rightarrow 1/2} \frac{8x^3 - 1}{16x^4 - 1}$

29. (1) Find the derivative of $\sin 2x$ with respect to x by using first principle method

(2) Compute the derivative of $f(x) = \frac{2}{x+1} - \frac{x^2}{3x-1}$

BHARATIYA VIDYA BHAVAN
SECOND TERMINAL EXAMINATION-2018-19
MATHEMATICS

STD : XI

Time: 3 Hours

Max marks:100

General Instructions:

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5. Question 13 – 23 in section C are long-answer –I type questions carrying 4 marks each.
6. Question 24 – 29 in section D are long-answer-II type questions carrying 6 marks each.

SECTION A

1. Find the 12th term of G.P whose 8th term is 192 and common ratio 2.
2. Find the angle between the lines $x + 2y = 11$ and $2x - y = 0$
3. Find the number of two- digit numbers by using the digits 0, 3, 7 if the repetition of digits is allowed

OR

If $nC_8 = nC_9$, find nC_{17}

4. Find the equation of the hyperbola whose vertices are $(\pm 5, 0)$ and foci are $(\pm 7, 0)$

SECTION B

5. Find the sum of n terms of an A.P whose k^{th} term is $5k + 1$
6. Find the equation of the straight line which passes through the point $(3, -2)$ and cuts off positive intercepts on the x axis and y axis, which are in the ratio of 4 : 3
7. For what point of the parabola $y^2 = 18x$ is the ordinate equal to three times the abscissa

OR

Find the equation of the circle having centre at $(3, -4)$ and touching the line

$$5x + 12y - 29 = 0$$

8 . A line passing through the points (a , 2a) and (-2,3) is perpendicular to the line

$$4x + 3y + 5 = 0. \text{ Find the value of } a$$

9. How many numbers are there between 100 and 1000 in which all the digits are distinct?

10. Find the multiplicative inverse of the complex number $3 - 2i$

11 . If $\tan x = \frac{3}{4}, \pi < x < \frac{3\pi}{2}$, find the value of $\sin \frac{x}{2}$

OR

If $\cos \theta = -\frac{1}{2}$ and $\pi < \theta < \frac{3\pi}{2}$, find the value of $4 \tan^2 \theta - 3 \operatorname{cosec}^2 \theta$

12 . Find the value of

$$9^{1/3} \cdot 9^{1/9} \cdot 9^{1/27} \cdot \dots$$

OR

Find the two numbers whose A.M is 25 and G.M is 20

SECTION C

13. Prove that $\tan 4x = \frac{4 \tan x (1 - \tan^2 x)}{1 - 6 \tan^2 x + \tan^4 x}$

OR

Prove that $\cos 6x = 32 \cos^6 x - 48 \cos^4 x + 18 \cos^2 x - 1$

14. If the sum of first p terms of an A.P is equal to the sum of the first q terms, then find the sum of the first $(p + q)$ terms

OR

The sum of three numbers in G.P is 56. If we subtract 1, 7, 21 from these numbers in that order we obtain an Arithmetic progression. Find the numbers

15 . How many terms of G.P $3, \frac{3}{2}, \frac{3}{4}, \dots$ are needed to give the sum $\frac{3069}{512}$?

16. Find the coordinates of the foci, the vertices, the length of major and minor axes and the eccentricity of the ellipse $9x^2 + 4y^2 = 36$

17. Find the coordinates of the orthocentre of the triangle whose vertices are A(0,0), B(-2,5), C(4, 3)

18. Reduce the following equation into normal form. Find the perpendicular distance from the origin and angle between perpendicular and the positive x- axis

$$X - \sqrt{3}y + 8 = 0$$

OR

Find the equation of a straight line through the point of intersection of the lines $4x - 3y = 0$ and $2x - 5y + 3 = 0$ and parallel to $4x + 5y + 6 = 0$

19. How many words, with or without meaning, each of 3 vowels and 2 consonants can be formed from the letters of the word 'INVOLUTE'?

20. A committee of 7 has to be formed from 9 boys and 4 girls. In how many ways can this be done when the committee consists of (1) exactly 3 girls (2) at most 3 girls

21. If ${}^n C_4$, ${}^n C_5$, and ${}^n C_6$ are in A.P then find n.

22. How many numbers greater than 1000000 can be formed by using the digits 1,2,0,2,4,2,4?

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

SECTION D

24. (1) Solve $2 \cos^2 \theta + 3 \sin \theta = 0$

(2) Prove that $\cos 2x \cos \frac{x}{2} - \cos 3x \cos \frac{9x}{2} = \sin 5x \sin \frac{5x}{2}$

25. (1) Express the complex number $\frac{1+2i}{1-3i}$ in polar form

(2) Solve $x^2 - (3\sqrt{2} + 2i)x + 6\sqrt{2}i = 0$

26. Find the sum of the following series up to n terms

$$\frac{1^3}{1} + \frac{1^3 + 2^3}{1+3} + \frac{1^3 + 2^3 + 3^3}{1+3+5} + \dots$$

27. Find the image of the point $(-8, 12)$ with respect to the line mirror

$$4x + 7y + 13 = 0$$

OR

3 - 11/11/15 - 21

The midpoints of the sides of a triangle are $(2, 1)$, $(5, 7)$, and $(-5, -5)$. Find the equation of the sides of the triangle

28. Find the number of arrangements of the letters of the word 'INDEPENDENCE.' In how many of these arrangements

(1) do the word start with P.

(2) do all the vowels occur together.

(3) do the vowels never occur together.

(4) do the words begin with I and end in P.

OR

The letters of the word 'RANDOM' are written in all possible orders and these words are written out as in a dictionary. Find the rank of the word 'RANDOM'

29. Show that the points $(9, 1)$, $(7, 9)$, $(-2, 12)$ and $(6, 10)$ are concyclic

OR

Find the equation of the circle which touches

(1) The x axis and whose centre is $(3, 4)$

(2) The x axis at the origin and whose radius is 5

(3) Both the axes and whose radius is 5

(4) The lines $x = 0$, $y = 0$ and $x = a$

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BHARATIYA VIDYA BHAVAN – KOCHI

SECOND UNIT TEST 2018-2019

MATHEMATICS

STD XI

Max Marks 25

Time 80 Mts

- 1) Simplify $\frac{\sin(180^\circ + \theta) \cos(360^\circ - \theta) \tan(270^\circ - \theta)}{\sec^2(90^\circ + \theta) \tan(-\theta) \sin(270^\circ + \theta)}$
- 2) Find the multiplicative inverse of $(2-3i)$.
- 3) Find the values of 'k' for which $\frac{-2}{7}, k, \frac{-7}{2}$ are in G. P. (3x1)
- 4) Convert $(-1 + i)$ into polar form.
- 5) Prove that $(\cos x + \cos y)^2 + (\sin x - \sin y)^2 = 4 \cos^2 \left(\frac{x+y}{2} \right)$
- 6) The first term of a G.P exceeds the second term by 2 and the sum to infinity is 50. Find the G.P.

OR

The sum of first three terms of a G.P is 16 and the sum of next three terms is 128. Find the first term and the common ratio.

- 7) Prove the identity $\tan 13A - \tan 7A - \tan 6A = \tan 13A \tan 7A \tan 6A$.
- 8) Find real numbers 'x' and 'y' if $(x-iy)(3+5i)$ is the conjugate of $(-1-3i)$ (5x2)
- 9) Find the general solution of the equation $\sin 2x + \sin 4x + \sin 6x = 0$

OR

In ΔABC , prove that $\frac{\cos A}{a} + \frac{\cos B}{b} + \frac{\cos C}{c} = \frac{a^2 + b^2 + c^2}{2abc}$

- 10) Find the square root of $(-16 - 30i)$
- 11) a) How many 3 digit numbers leave the remainder 2 when divided by 9?
b) For what value of 'n', the 'n'th terms of the sequences 63, 65, 67, and 3, 10, 17, are equal?
- 12) Find the sum to n-terms of the sequence 2.5 + 5.8 + 8.11 + (4x3)

MATHEMATICS

1. If A and B are two sets and A' denotes the complement of A, then find $A \cap (A \cup B)'$ (1)
2. Write the following sets in Roster form
 - (a) $A = \{x: x \in R, 2x + 11 = 15\}$
 - (b) $B = \{x: x \text{ is a positive factor of a prime number } p\}$ (2)
3. If $P = \{x: x < 3, x \in N\}$ $Q = \{x: x \leq 2, x \in W\}$, find $(P \cup Q) \cap (P \cap Q)$ (2)
4. If the function $f: R \rightarrow R$ defined by $f(x) = 2x - [x] + |x|$. Find (a) $f(-\frac{1}{2})$ (b) $f(3.1)$ (2)
5. In a right angled triangle, the difference between two acute angles is $\frac{\pi}{9}$. Express all the angles in degrees. (2)
6. Solve the inequalities and represent the solution on a number line
 $2(x-1) < x+5$, $3(x+2) > 2-x$ (2)
7. If A and B are two sets such that $n(A-B) = 14+x$, $n(B-A) = 3x$ and $n(A \cap B) = x$ then draw Venn diagram to illustrate the information. Also find x and $n(A \cup B)$ if $n(A) = n(B)$. (3)
8. Let R be the relation on set N of natural numbers defined by $a+3b=12$.
Find (i) R (ii) Domain of R (iii) Range of R (3)
9. Find the angle in radian through which a pendulum swings if its length is 75 cm and tip describes an arc of length 21cm. (3)
10. (a) Solve the inequality $2(2x+3)-10 < 6(x-2)$ when (i) x is an integer
 (ii) x is a real number
 (b) Find all pairs of consecutive even positive integers both of which are larger than 5 such that their sum is less than 23. (4)
11. Prove by the following using the Principle of Mathematical Induction for all $n \in N$
 $1^2 + 3^2 + 5^2 + \dots + (2n-1)^2 = \frac{n(2n-1)(2n+1)}{3}$ (4)
12. Prove by Principle of Mathematical Induction that
 $n^3 - 7n + 3$ is divisible by 3, for every $n \in N$ (4)
13. A survey of 500 television viewers produced the following information : 285 watch Football, 195 watch hockey, 115 watch basketball, 45 watch football and basketball. 70 watch football and hockey, 50 watch hockey and basketball, 50 do not watch any of the three games. How many watch all the three games? How many watch exactly one of the three games? (4)
14. Find the domain and range of the following functions
 - (a) $f(x) = \frac{1}{\sqrt{x-1}}$
 - (b) $f(x) = |x+3|$ (4)
15. Solve the following system of linear inequalities graphically
 $x+y \geq 1$, $y \leq 5$, $x \leq 6$, $7x+9y \leq 63$, $x \geq 0$, $y \geq 0$ (4)
16. Find the mean, variance and standard deviation for the following frequency distribution

Classes	0-10	10-20	20-30	30-40	40-50
Frequencies	5	8	15	16	6

(6)

BHARATIYA VIDYA BHAVAN, KOCHI

FIRST UNIT TEST 2018-19

MATHEMATICS

Std.: XI

Time: 80 mins

Marks: 25

1) If $n(A-B) = 30$, $n(B-A) = 50$ and $n(A \cap B) = 20$, then find $n(A \cup B)$

2) Write the set $\{0, \frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \frac{5}{6}\}$ in the set builder form.

(2x1 = 2)

3) Write the power set of $A = \{1, \{2\}\}$

4) Using properties of sets, prove that,

$$A - (B \cap C) = (A - B) \cup (A - C)$$

5) If $U = \{a, b, c, d, e, f\}$, $A = \{a, c, d\}$, $B = \{c, d, f\}$.

$$\text{Verify } (A \cup B)' = A' \cap B'$$

(3x2 = 6)

6) Let $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$, $A = \{1, 3, 5, 7, 9\}$, $B = \{2, 4, 6, 8, 10\}$ and $C = \{1, 2, 3, 4\}$.

Find (1) $A \cap (B \cup C)$ (2) $A' \cap (B \cup C)'$ (3) $A - (B - C)$

7)

Write the following in the roster form:

(a) $\{x : x \in \mathbb{Z}, x^2 < 36\}$

(b) $\{x : x = \frac{2}{3n+1}, n \leq 5, n \in \mathbb{N}\}$

c) Write the interval $[-3, 4)$ in the set-builder form.

8) Prove the following using the Principle of Mathematical Induction for all $n \in \mathbb{N}$

$$\frac{1}{3 \cdot 5} + \frac{1}{5 \cdot 7} + \frac{1}{7 \cdot 9} + \dots + \frac{1}{(2n+1)(2n+3)} = \frac{n}{3(2n+3)}$$

(3x3 = 9)

9) Using the Principle of Mathematical Induction, prove that $4^n + 15n - 1$ is divisible by 9.

10) In a survey of 25 students, it was found that 15 had taken Mathematics, 12 had taken Physics, and 11 had taken Chemistry. 5 had taken Mathematics and Chemistry, 9 had taken Mathematics and Physics, 4 had taken Physics and Chemistry, and 3 had taken all three subjects. Find the number of students that had taken, -

- a) only Maths
- b) Maths and Physics but not Chemistry
- c) only one of the three subjects
- d) none of the three subjects.

(2x4= 8)

THIRUVAMKULAM

BHARATIYA VIDYA BHAVAN, KOCHI KENDRA

ANNUAL EXAMINATION, 2017-'18

STD: XI

MATHEMATICS

Time: 3 hrs

Max. Marks : 100

General Instructions:-

- i) All questions are compulsory
- ii) The question paper consists of 29 questions divided into four sections A, B, C and D. Section A contains 4 questions of 1 mark each, section B comprises of 8 questions of 2 marks each, section C comprises of 11 questions of 4 marks each and section D comprises of 6 questions of 6 marks each.

SECTION A

1. Find the equation of the ellipse whose vertices are $(\pm 13, 0)$ and foci are $(\pm 5, 0)$
2. Given $P(A) = \frac{3}{5}$ and $P(B) = \frac{1}{5}$. Find $P(A \text{ or } B)$ if A and B are mutually exclusive.
3. Find the range of series
3, 7, 9, 20, 72, 50, 41, 92
4. Write the contrapositive of the statement
"If the two lines are parallel, then they do not intersect in the same plane."

SECTION B

5. Find k so that $\lim_{x \rightarrow 2} f(x)$ exists, where $f(x) = \begin{cases} 2x + 2 & \text{if } x \leq 2 \\ x + k & \text{if } x > 2 \end{cases}$
6. Find the domain and range of $f(x) = -|x|$
7. Find the number of 4-digit numbers that can be formed using the digits 1, 2, 3, 4 and 5 if no digit is repeated. How many of these will be even?
8. Find a if the 17th and 18th terms of the expansion $(2 + a)^{20}$ are equal.
9. The centroid of a triangle ΔABC is at $(1, 1, 1)$. If the co-ordinates of A and B are $(3, 5, 7)$ and $(-1, 7, -6)$ respectively, find the co-ordinates of C.
10. A letter is chosen at random from the word 'ASSASSINATION'. Find the probability that letter is (i) a vowel (ii) a consonant

11. Equation of a line is $3x-4y+10=0$. Find its
(1) slope (2) x intercept (3) y intercept.

12. Solve $2x^2+x+1=0$

SECTION C

13. Prove by mathematical induction for all $n \in \mathbb{N}$

$$\frac{1}{3.5} + \frac{1}{5.7} + \frac{1}{7.9} + \dots + \frac{1}{(2n+1)(2n+3)} = \frac{n}{3(2n+3)}$$

14. Solve graphically

$$3x+4y \leq 12, 4x+3y \leq 12, x \geq 0, y \geq 0$$

15. Find the co-ordinates of the point on the y axis which are at a distance of $5\sqrt{2}$ from the point (3,-2,5)

16. Evaluate

$$\lim_{x \rightarrow 0} \frac{\sqrt{2+x} - \sqrt{2}}{x}$$

OR

$$\lim_{x \rightarrow 2} \frac{x^{10} - 1024}{x^5 - 32}$$

17. If four 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

- i) the digits are repeated .
- ii) the repetition of digits is not allowed.

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

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

20. Two students Naveen and Neha appeared in an examination. The probability that Naveen will qualify the examination is 0.05 and that Neha will qualify the

examination is 0.10. The probability that both will qualify the examination is 0.02. Find the probability that

a) Both Naveen and Neha will not qualify the examination.

b) At least one of them will not qualify the examination.

c) Only one of them qualify the examination.

21. Find the square root of $-16-30i$

22. In a relay race there are 5 teams A, B, C, D and E

a) What is the probability that A, B and C finish first, second and third respectively?

b) What is the probability that A, B, C are first three to finish in any order assuming that all finishing orders are equally likely?

c) Write one value relevant to this context

23. In a survey it was found that 21 people liked product A, 26 liked product B and 29 liked product C. If 14 people liked product A and B, 12 people liked products C and A, 14 people liked products B and C and 8 liked all the three products. Find how many liked product C only.

SECTION D

24. a) Solve $2\cos^2 x + 3\sin x = 0$

b) Prove that

$$(\cos x - \cos y)^2 + (\sin x - \sin y)^2 = 4\sin^2\left(\frac{x-y}{2}\right)$$

25. The sum of three numbers in a G.P is 56. If we subtract 1, 7, 21 from these numbers in that order, we obtain an A.P. Find the numbers.

OR

Find the sum to n terms of the series

$$1^2 + (1^2 + 2^2) + (1^2 + 2^2 + 3^2) + \dots$$

26. Evaluate

$$a) \lim_{x \rightarrow 0} \frac{\tan x - \sin x}{\sin^3 x}$$

b) $\lim_{x \rightarrow 0} \log \left(\frac{1+7x}{x} \right)$

27. Find the distance of the line $4x+7y+5=0$ from the point $(1,2)$ along the line $2x-y=0$

28.a) Express in polar form

$$\frac{1+2i}{1-3i}$$

b) If $(x+iy)^3 = u+iv$ prove that

$$\frac{u}{x} + \frac{v}{y} = 4(x^2 - y^2)$$

29. Find the derivative of

a) $(x+\cos x)(x-\tan x)$

b) $\frac{\sin x + \cos x}{\sin x - \cos x}$

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BHARATIYA VIDYA BHAVAN – KOCHI KENDRA
SECOND TERMINAL EXAMINATION 2017-2018
MATHEMATICS

CLASS -XI

Maximum marks 100
Time: 3 hrs.

General Instructions:

- (i) All questions are compulsory
- (ii) This question paper contains 29 questions
- (iii) Question numbers 1 to 4 in Section - A are very short answer type questions, carrying one mark each.
- (iv) Question numbers 5 to 12 in Section - B are short answer type questions, carrying two marks each.
- (v) Question numbers 13 to 23 in Section - C are long answer I type questions, carrying four marks each.
- (vi) Question number 24 to 29 in Section - D are long answer II type questions carrying six marks each.

SECTION - A

1. Find the slope of a line which makes an angle 30° with positive direction of y-axis.
2. Find the equation of the parabola with vertex(0,0), passing through(2,3) and axis is along X-axis.
3. Find the number of diagonals of a convex octagon.
4. For what values of x the numbers $\frac{-2}{7}, x, \frac{-7}{2}$ are in G.P.

SECTION - B

5. Find the equation of the line passing through (-3,5) and perpendicular to the line through the points (2,5) and (-3,6).
6. Find the point on x-axis whose distance from the line $\frac{x}{3} + \frac{y}{4} = 1$ are 4 units
7. Find the centre and radius of the circle $x^2 + y^2 - 8x + 10y - 12 = 0$.
8. Prove that $:6^{\frac{1}{2}} \cdot 6^{\frac{1}{4}} \cdot 6^{\frac{1}{8}} \dots = 6$
9. Find r , if ${}^5P_r = 2 {}^6P_{r-1}$
10. Find the 20^{th} and n^{th} terms of the G.P $\frac{5}{2}, \frac{5}{4}, \frac{5}{8}, \dots$
11. Find a positive value of m for which the coefficient of x^2 in the expansion $(1+x)^m$ is 6.
12. Solve the inequalities $7 \leq \frac{3x+11}{2} \leq 11$

SECTION - C

13. If p is the length of the perpendicular from the origin to the line whose intercepts on the axes are a and b , then show that $\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$
14. Find the image of the point (3,8) with respect to the line $x+3y=7$ assuming the line to be a plane mirror.

OR

The perpendicular from the origin to the line $y = mx + c$ meets it at the point $(-1,2)$. Find the values of m and c .

15. Find the equation of the ellipse with major axis along the x-axis and passing through the points (4,3) and (-1,4).

16. A group consists of 4 girls and 7 boys. In how many ways can a team of 5 members be selected if the team has (i) no girl? (ii) at least one boy and one girl? (iii) should a single gender be given special privilege in the society?
17. Find the number of words with or without meaning which can be made using all the letters of the word AGAIN. If the words are written as in a dictionary, what will be the 50th word?
18. How many numbers greater than 1000000 can be formed by using the digits 1, 2, 0, 2, 4, 2, 4?
19. In how many ways can the letters of the word PERMUTATIONS be arranged if the (i) words start with P and end with S (ii) vowels are all together (iii) there are always 4 letters between P and S?

OR

In how many of the distinct permutations of the letters in MISSISSIPPI do the four I's not come together?

20. Find the term independent of x in the expansion of $(\sqrt[3]{x} + \frac{1}{2\sqrt[3]{x}})^{18}$, $x > 0$.
21. Compute $(98)^5$
22. Find the sum of the sequence 7, 77, 777, 7777, ... to n terms
23. Find four numbers forming a geometric progression in which the third term is greater than the first term by 9 and the second term is greater than the 4th by 18.

OR

If A.M and G.M of two positive numbers a and b are 10 and 8 respectively, find the numbers.

SECTION - D

24. Find the equation of the line passing through the point of intersection of the lines $4x+7y-3=0$ and $2x-3y+1=0$ that has equal intercepts on the axes.

OR

Find the equation of the line through the intersection of the lines $5x-3y=1$ and $2x+3y-23=0$ and perpendicular to the line $5x-3y-1=0$

25. Find the co-ordinates of the foci and the vertices, the eccentricity and the length of the latus rectum of the hyperbola $49y^2 - 16x^2 = 784$.
26. What is the number of ways of choosing 4 cards from a pack of 52 playing cards? In how many of these (i) four cards are of the same suit (ii) four cards belong to four different suits (iii) are face cards (iv) two are red cards and two are black cards.
27. The second, third and fourth terms in the binomial expansion $(x+a)^n$ are 240, 720 and 1080 respectively. Find x , a and n .

OR

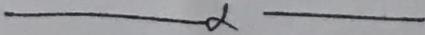
The coefficients of the $(r-1)^{th}$, r^{th} , and $(r+1)^{th}$ terms in the expansion of $(x+1)^n$ are in the ratio 1:3:5. Find n and r .

28. Solve the system of inequalities graphically: $2x+y \geq 4$, $x+y \leq 3$, $2x-3y \leq 6$.
29. Find the sum of the first n terms of the series: $3+7+13+21+31+ \dots$

BHARATIYA VIDYA BHAVAN
SECOND UNIT TEST 2017-18
MATHEMATICS

Std: XI

Time : 80 min
Marks: 25

1. Solve the inequality for real x : $3(2-x) \geq 2(1-x)$ (1x1=1)
 2. Find the term independent of x in the expansion of $\left[x^2 - \frac{2}{x}\right]^9$
 3. How many different words can be formed by using all the letters of the word "INDIAN".
In how many of these do the consonants come together?
 4. In an A.P. the first term is 2 and the sum of the first 5 terms is one-fourth of the next five terms. Find its 20th term.
 5. Four cards are drawn from a pack of 52 playing cards. In how many of these
 - (a) Have cards of same suit
 - (b) Two are red cards and two are black cards(2 x 4 = 8)
 6. Find $(a+b)^6 - (a-b)^6$. Hence evaluate $(\sqrt{3} + \sqrt{2})^6 - (\sqrt{3} - \sqrt{2})^6$
 7. Find the sum to n terms of the series $3 \times 8 + 6 \times 11 + 9 \times 14 + \dots$
 8. If S_1, S_2 , and S_3 respectively the sum of $n, 2n$ and $3n$ terms of a G.P, prove that
 $S_1(S_3 - S_2) = (S_2 - S_1)^2$
 9. A committee of 7 persons is to be formed from 6 men and 4 women.
 - (a) In how many ways this can be done if at least 3 men have to be included in the committee?
 - (b) In how many of these women are in majority?
 - (c) Should women be given equal rights? What values are being promoted?(3x4=12)
 10. Solve the following system of inequalities graphically
$$\begin{aligned}x + 3y &\leq 12 \\ 3x + y &\leq 12 \\ x, y &\geq 0\end{aligned}$$
(4 x 1 = 4)
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BHARATIYA VIDYA BHAVAN, KOCHI KENDRA

FIRST TERMINAL EXAMINATION 2017-18

MATHEMATICS

STD XI

MAX MARKS :50

TIME 2 HRS

1. If $5 \tan \theta = 4$, find $\frac{5 \sin \theta - 3 \cos \theta}{5 \sin \theta + 2 \cos \theta}$ (1)
2. (i) Write as interval $\{x; x \in R, -4 < x \leq 6\}$
(ii) Write in set builder form $\left\{\frac{1}{3}, \frac{2}{6}, \frac{3}{11}, \frac{4}{18}, \frac{5}{27}, \frac{6}{38}\right\}$ (2)
3. (i) Find 'a' and 'b' if $(2a+b, a-b) = (8, 3)$
(ii) If $A = \{-1, 2, 3\}$ $B = \{1, 3\}$ find $B \times A$ (2)
4. If $A = \{2, 4, 6, 9\}$ $B = \{4, 6, 18, 27\}$ and $R: A \rightarrow B$ is a relation given by
 $R = \{(a, b): a \text{ is a factor of } b \text{ and } a < b\}$, express R in roster form. Also write its domain and range. (3)
5. If $U = \{1, 2, 3, 4, \dots, 10\}$ $A = \{3, 5, 7, 9, 10\}$ $B = \{2, 4, 7, 9\}$ and $C = \{1, 5, 7\}$ find
(i) $A \cap (B \cup C)$ (ii) $A - B$ (iii) $(A' \cap B') \cap C$ (3)
6. Find the angle in degrees through which a pendulum swings if its length is 50cm and the tip describes an arc of length 16 cm.
OR
Find the value of
$$\frac{\operatorname{cosec}(90+\theta) + \cot(450+\theta)}{\operatorname{cosec}(90-\theta) + \tan(180-\theta)} + \frac{\tan(180+\theta) + \sec(180-\theta)}{\tan(360+\theta) - \sec(-\theta)}$$
 (3)
7. i) Prove that $4 \sin A \sin(60-A) \sin(60+A) = \sin 3A$
ii) Prove that $\tan 75 - \tan 30 - \tan 75 \tan 30 = 1$ (3)
8. Solve $\cos \theta + \cos 2\theta + \cos 3\theta = 0$ (3)
9. (i) Find the domain and range of the function $f(x) = \frac{x^2-1}{x-1}$
(ii) Let f be a linear function defined on Z and $(1,1), (2,3), (3,5), (4,7) \in f$. Find f . (4)
10. In any $\triangle ABC$, prove that
i) $a \sin(B-C) + b \sin(C-A) + c \sin(A-B) = 0$
ii) $a(b \cos C - c \cos B) = b^2 - c^2$ (4)
11. Prove that $\frac{\sec 8A - 1}{\sec 4A - 1} = \frac{\tan 8A}{\tan 2A}$

OR

$$\frac{\tan 5\theta + \tan 3\theta}{\tan 5\theta - \tan 3\theta} = 4 \cos 2\theta \cos 4\theta$$

(4)

12. Prove using Principle of Mathematical Induction

$$\frac{1}{2.5} + \frac{1}{5.8} + \frac{1}{8.11} + \dots + \frac{1}{(3n-1)(3n+2)} = \frac{n}{6n+4}, \text{ for all } n \in N \quad (4)$$

13. $41^n - 14^n$ is divisible by 7, for all $n \in N$ (4)

14. In a survey of 60 people, it was found that 25 people read newspaper H, 26 read news paper T, 26 read newspaper M, 9 read both H and M, 11 read both H and T, 8 read both T and M, 3 read all the three. Find

- i) The number of people who read at least one of the newspapers
- ii) The number of people who read exactly one news paper.
- iii) Mention any two advantages of newspaper reading (4)

15. Find mean, standard deviation and variance of the following data

classes	30-40	40-50	50-60	60-70	70-80	80-90	90-100
frequency	3	7	12	15	8	3	2

(6)

Lib

BHARATIYA VIDYA BHAVAN, KOCHI

STD XI

FIRST UNIT TEST - 2017

Max.Marks:25

MATHEMATICS

TIME : 80 min

1. Write $A = \{x : x \in \mathbb{Z}, x^2 \leq 4\}$ in roster form.
2. Write $\{\frac{1}{3}, \frac{3}{5}, \frac{5}{7}, \frac{7}{9}, \frac{9}{11}\}$ in set builder form.
3. If $n(A) = 3$ and $n(B) = 2$ then find the maximum number of non empty relations that can be defined from A to B.
(1 x 3 = 3 marks) (2)
4. If $A = \{x : x \in \mathbb{W}, x < 2\}$ $B = \{x : x \in \mathbb{N}, 1 < x < 5\}$ $C = \{3, 5\}$ Find $A \times (B \cap C)$. (2)
5. Let $A = \{1, 2, 3, 4, 5\}$. A relation R on set A is defined by $R = \{(x, y) : y = x + 1\}$.
 - (i) Depict this relation using an arrow diagram.
 - (ii) Find domain, co-domain and range of R.(3)
6. (i) A and B are two sets such that $n(A - B) = 14 + x$, $n(B - A) = 3x$ and $n(A \cap B) = x$.
If $n(A) = n(B)$, then find the value of x.
(iii) Let $U = \{1, 2, 3, \dots, 9\}$, $A = \{1, 2, 3, 4\}$, $B = \{2, 4, 6, 8\}$,
Verify that $(A \cup B)' = A' \cap B'$ (3)
7. (i) Let f and g be two real valued functions, defined by $f(x) = x^2$, $g(x) = [x]$ find
 - (a) $(f + g)(-2.5)$.
 - (b) $(f \cdot g)(\frac{1}{2})$(ii) Let $X = \{1, 2, 3, 4\}$ Examine whether the relation $R = \{(1, 2), (2, 3), (3, 4), (4, 3), (2, 1)\}$ defined on X, is a function or not. Why? (3)
8. Using properties, prove that
 - (i) $A = (A \cap B) \cup (A - B)$
 - (ii) $A \cup (B - A) = A \cup B$(3)
9. Find the domain and range of
 - (i) $f(x) = \frac{1}{\sqrt{x-5}}$
 - (ii) $f(x) = \frac{|x-4|}{x-4}$(4)
10. In a group of 50 people, 30 like to play cricket, 25 like to play foot ball and 32 like to play hockey and assume that each one likes to play at least one of the three games. If 15 people like to play both cricket and football, 11 like to play foot ball and hockey and 18 like to play cricket and hockey, then
 - (i) How many like to play all the three games?
 - (ii) How many like to play only foot ball?
 - (iii) What is the importance of sports and games in our life?(Mention any two)(4)