Annual Examination [2020 – 21]			
Student Name		**Grade**	**XI**
Date	**22/02/2021**	**Subject**	**MATHEMATICS**
	Time **3Hr**	**Total Marks**	**80**

General Instructions:

i.   This question paper contains two parts A and B. Each part is compulsory. Part A carries 24 marks and Part B carries 56 marks

ii. Part-A has Objective Type Questions and Part -B has Descriptive Type Questions

iii. Both Part A and Part B have choices.

Part – A:

i.   It consists of two sections- I and II.

ii. Section I comprises of 16 very short answer type questions.

iii. Section II contains 2 case studies. Each case study comprises of 5 case-based MCQs. An examinee is to attempt any 4 out of 5 MCQs.

Part – B:

i.   It consists of three sections- III, IV and V.

ii.   Section III comprises of 10 questions of 2 marks each.

iii. Section IV comprises of 7 questions of 3 marks each.

iv.   Section V comprises of 3 questions of 5 marks each.

v.   Internal choice is provided in 3 questions of Section –III, 2 questions of SectionIV and 3 questions of Section-V. You have to attempt only one of the alternatives in all such questions.

Part – A   Section - I

1. Let A, B and C be three sets. If $A \subset B$ and $B \subset C$, is it true that $A \subset C$? If not give an example.

OR

Let $A = \{a, b\}$ and $B = \{a , b, c\}$. Is $\therefore A \subset B$, What is $A \cup B = \{a, b, c\} = B$

2. In which octant does the given point $(-3 , -1, 4)$ lie.

3. Prove that cos 50° cos 10° - sin 50° sin 10° = 1/2

OR

Express as the product of sines and cosines: sin 15x - sin x.

4. Express the complex number $\sin 50^0 + i \cos 50^0$ in the polar form.
5. In how many ways can 5 letters be posted in 4 letter boxes?

OR

In how many ways can the letters of the word PARALLEL be arranged so that all L's do not come together?

6. Find the arithmetic mean between: 14 and -6
7. Find the slope of the line passing through the points (4, -3) and (6, -3).

OR

Write the equation of the line through the points $(1, -1)$ and $(3, 5)$

8. Find the equation of a circle with centre (-3, -2) and radius 6.
9. Given that N = {1, 2, 3, ..., 100}, then
   Write the subset B of N, whose element are represented by x + 2, where x $\in$ N.

OR

If A and B are two sets such that n(A) = 17, n(B) = 23 and n(A $\cup$ B) = 38, find number of elements in exactly one of A and B.
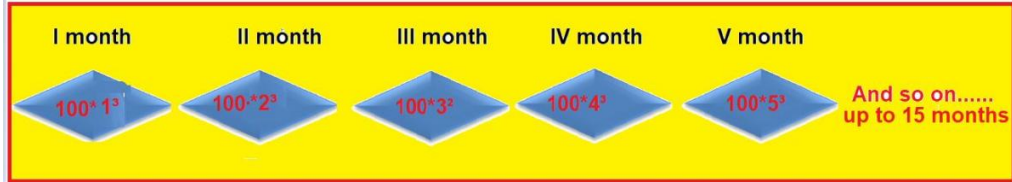
10. The letters of word 'SOCIETY' are placed at random in a row. What is the probability that three vowels come together?
11. Find the distance between (2, 3, 5) and (4, 3, 1) pairs of points.
12. How many different words can be formed from the letters of the word 'GANESHPURI'? In how many of these words: the vowels are always together?
13. Determine whether the functions are even or odd or neither: $g(x) = 3x^2 + 1$.
14. Prove that: $\sin^2 (n+1) A - \sin^2 nA = \sin (2n + 1) A \sin A$.
15. Solve: |x - 2 | > 5
16. State whether {x $\in$ Z : x < 5} is infinite or finite set.

Section - II

17. **Read the Case study given below and attempt any 4 sub parts:**

Ratan wants to open an RD for the marriage of his daughter, He visited the branch of SBI at sector 3, Gurgaon.

There he made an agreement with the bank.

I month	II month	III month	IV month	V month	
100×1^3	100×2^3	100×3^2	100×4^3	100×5^3	And so on...... up to 15 months

According to this agreement, he would deposit Rs $100 \times\times n^2$ every month (here n =1 to 15).
Other terms and conditions are as follows:

    i.   He has to pay a minimum of six instalments.
    ii.   If he continues the deposit up to 15 months then the bank will pay 20% extra as a bonus.
    iii.   If he breaks the deposit after 6 months then the bank will pay 10% extra as a bonus
    iv.   If he breaks the deposit after 10 months then the bank will pay 15% extra as a bonus.
    v.   No other interest will be paid by the bank.

Answer the following questions:

    i.   How much amount would be accumulated after 15 months?
        a. Rs 14,40,000
        b. Rs 11,02,500
        c. Rs 10,00,000
        d. Rs 15,00,000

    ii.   How much total amount would Ratan get after 15 months?
        a. Rs 14,40,000
        b. Rs 17,28,000
        c. Rs 13,23,000
        d. Rs 15,00,000

    iii. How much total amount would Ratan get if he breaks the deposit after 10 months?

        a. Rs 3,45,875
        b. Rs 3,50,000
        c. Rs 3,23,000
        d. Rs 3,47,875

iv. How much total amount would Ratan get if he breaks the deposit after 6 months?

    a. Rs 65,875
    b. Rs 50,000
    c. Rs 50,715
    d. Rs 60,000

V. How much amount did Ratan pay in the 10th month?

    a. Rs 1,00,000
    b. Rs 729,000
    c. Rs 50,715
    d. Rs 60,000

18. **Read the Case study given below and attempt any 4 subparts:**

One evening, four friends decided to play a card game Rummy. Rummy is a card game that is played with decks of cards. To win the rummy game a player must make a valid declaration by picking and discarding cards from the two piles given. One pile is a closed deck, where a player is unable to see the card that he is picking, while the other is an open deck that is formed by the cards discarded by the players. To win at a rummy card game, the players have to group cards invalid sequences and sets.

In rummy, the cards rank low to high starting with Ace, 2, 3, 4, 5, 6, 7, 8, 9, 10, Jack, Queen, and King. Ace, Jack, Queen, and King each have 10 points. The remaining cards have a value equal to their face value. For example, 5 cards will have 5 points, and so on.

Four cards are drawn from a pack of 52 playing cards, then:

i.   How many different ways can this is done
    a. 52! / 4!48!
    b. 48! / 4!52!
    c. 52!4! / 48!
    d. 48!4! / 52!

ii. exactly one card of each suit

    a. 13 ways.
    b. $(13)^4$ ways
    c. $(13)^2$ ways.
    d. 13_{C1}

iii. all cards of the same suit

    a. 2060 ways.
    b. 2800 ways.
    c. 2860 ways.
    d. 2000 ways.

iv. all club cards

    a. 751 ways.
    b. 175 ways.
    c. 517 ways.
    d. 715 ways.

v. The value of $P(n, n - 1)$ is

    a. n
    b. 2n
    c. n!
    d. 2n!

vi. If nPr = 3024 and nCr = 126 then find n and r.

    a. 9, 4
    b. 10, 3
    c. 12, 4
    d. 11, 4

Part - B   Section - III

19. If X and Y are two sets such that X has 40 elements X∪Y has 60 elements and X∩Y has 10 elements, how many elements does Y have?

20. Let X = {2, 3, 4, 5} and Y = {7, 9, 11, 13, 15, 17}. Define a relation f from X to Y by:
    f = {(x, y) : x ∈ X, y ∈ Y and y = 2x + 3}.

    i. Write f in roster form.
    ii. Find dom (f) and range (f).
    iii. Show that f is a function from X to Y.

OR

if A = {1, 3, 5} and B = {2, 3}, then show that A × B ≠ B × A.

21. Show that the sum $(1 + i^2 + i^4 + ... + i^{2n})$ is 0 when n is odd and 1 when n is even.
22. Solve: $ix^2 + 4x - 5i = 0$.
23. If $(1+i)^2/2-i = x + iy$, then find the value of x + y.

OR

Simplify and express $(-2 + \sqrt{-3})^{-1}$ in the form(a + ib).

24. On her vacation veena visits four cities (A, B, C and D) in a random order. What is the probability of A either first or second?
25. Differentiate $x^4 \tan x$.
26. Events E and F are such that P (not E or not F) = 0.25 state whether E and F are mutually exclusive.
27. An analysis of monthly wages paid to the workers of two firms A and B belonging to the same industry gives the following results:

	Firm A	Firm B
Number of workers	1000	1200
Average monthly wages	Rs 2800	Rs 2800
Variance of distribution of wages	100	169

In which firm, A or B is there greater variability in individual wages?

28. Write the value of the expression $\dfrac{1 - 4\sin 10° \sin 70°}{2\sin 10°}$

OR

Prove that $\tan 6° \tan 42° \tan 66^0 \tan 78^0 = 1$

Section - IV

29. Let $x_1, x_2, x_3, ..., x_n$ be n values of a variable X, and let $Xj = a + hui$, i = 1, 2, . . n, where u_i, $u_2,...,u_n$ are the values of variable U. Then, prove that Var (X) = h^2 Var (U), h ≠ 0.

30. Let f={(x,$\dfrac{x^2}{1 + x^2}$):x∈R} be a function from R into R. Determine the range of f.
31. If the nth term of the A.P. 9, 7, 5, ... is same as the nth term of the A.P. 15, 12, 9, ... find n.

OR

Insert three geometric means between $\dfrac{1}{3}$ and 432.

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

33. How many four digit different numbers, greater than 5000 can be formed with the digits 1, 2, 5, 9, 0 when repetition of digits is not allowed?

34. Point R(h, k) divides a line segment between the axis in the ratio 1 : 2. Find equation of the line.

OR

Find equation of the line through the point (0, 2) making an angle $2\pi / 3$ with the positive x-axis. Also, find the equation of line parallel to it an crossing the y-axis at a distance of 2 units below the origin.

35. In a group of 400 people in USA, 250 can speak Spanish and 200 can speak English. How many people can speak both Spanish and English?

Section - V

36. Differentiate If $y = \sqrt{\dfrac{sec\ x - tan\ x}{sec\ x + tan\ x}}$ Show that $\dfrac{dy}{dx}$ = (sec x tan x + sec x)
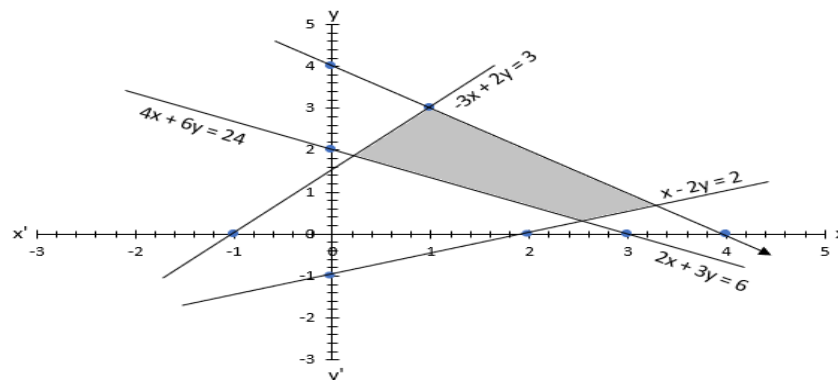
OR

Differentiate the function by first principle: $e^{\sqrt{ax\ +b}}$

37. Solve the inequality $\dfrac{(2x-1)}{3} \geq \dfrac{3x-2}{4} - \dfrac{(2-x)}{5}$

Or

Solve the inequality $5\ (2x - 7) - 3\ (2x + 3) \leq 0$ and $2x + 19 \leq 6x + 47$.

38. Find the linear inequations for which the shaded area in the figure is the solution set. Draw the diagram of the solution set of the linear inequations:

OR

Check whether the half plane $3x + 4y \geq 6$ contains the origin. Also, shade the half plane not containing the origin.