Instructions:

1. The question paper has five parts namely A, B, C, D and E. Answer all the parts.

2. Use the graph sheet for the question on linear inequalities in Part-D.

PART-A

I   Answer ALL the questions: **10 x 1 = 10**

1   If A = {1, 2}, B = {3, 4} and C = {5, 6} find (A-B) x C.

2   Find the range of the function $f(x) = \sqrt{9 - x^2}$, where $x \in R$.

3   Express $\dfrac{5\pi}{3}$ in degree measure.

4   Find the modules of $\dfrac{1+i}{1-i}$.

5   Solve $7x + 3 < 5x + 9$, $x \in N$.

6   Find 'n' if $^nC_7 = {}^nC_6$.

7   Find the 10th term of 5, 25, 125, …..

8   Write the negation of "Every natural number is greater than zero."

9   Name the plane in which the point (-3, 0, 4) lies.

10   Two series A and B with equal means have standard 9 and 10 respectively. Which series is more consistent?

PART-B

II   Answer any TEN questions: **10 x 2 = 20**

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

12   Let A = {1, 2, 3……….14}. Define a relation R from A to A, by R = {(x, y) : 3x − y = 0, where x, y ∈A} write down its domain and range.

13   Let A = {1, 2} and B = {3, 4}. Write A x B. How many subsets will A x B have?

14   Find the value of $\text{Cos}15°$.

15   Find the general solution of $\text{Sin}2x + \text{Cos}x = 0$.

16   Express $\left(\dfrac{1}{3} + 3i\right)^3$ in the form a + ib.

17   Find the point on the x-axis, which is equidistant from the points (7, 6) and (3, 4).

18   Find the equation of ellipse, whose ends of major axis (± 3,0) ends of minor axis (0, ± 2)

19   Show that the points (-4, 6, 10), (2, 6, 6) and (14, 0, -2) are collinear.

20 Evaluate $\displaystyle \lim_{x \to 1} \left(\frac{x^{15} - 1}{x^{10} - 1} \right)$.

21 Write cotrapositive and consense of the statement "If a number n is even than n^2 is even."

22 Find the sum to n terms of the A.P., whose k^{th} term is 5k+1.

23 How many words, with or without meaning can be formed using all the letters of the word EQUATION, using each letter exactly once?

24 Given $P(A) = \dfrac{3}{5}$, and $P(B) = \dfrac{1}{5}$. Find the P(A or B), if A and B are mutually exclusive events.

PART-C

III Answer any TEN questions: 10 x 3 = 30

25 In a group of 65 people, 40 like cricket, 10 like both cricket and tennis. How many like tennis only and not cricket? How many like tennis?

26 Let f = {(1,1), (2, 3), (0, -1), (-1, -3) } be a function from Z to Z defined by f(x) = ax + b, for some integers a, b. Determine a and b.

27 Prove that $\sin 3x = 3\sin x - 4\sin^3 x$.

28 Convert the complex number $\dfrac{-16}{1 + i\sqrt{3}}$ into polar form.

29 Determine n if, $^{2n}C_3 : {}^nC_3 = 12:1$.

30 Find the term independent of x in the expansion of $\left(\dfrac{3}{2} x^2 - \dfrac{1}{3x} \right)^6$.

31 Find the focus, directrix, and length of the latus rectum of the parabola $x^2 = -16y$.

32 Evaluate $\displaystyle \lim_{x \to \frac{\pi}{2}} \left(\frac{\tan 2x}{x - \dfrac{\pi}{2}} \right)$.

33 Find the derivative of Cosx w.r.t. x from the first principles.

34 The sum of first three terms of a GP is $\dfrac{39}{10}$ and their product is 1. Find the common ratio and the terms.

35 Verify by the method of contradition that: "$\sqrt{2}$ is an irrational number."

36 Find the angle between the lines $y - \sqrt{3}x - 5 = 0$ and $\sqrt{3}y - x + 6 = 0$.

37 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?

38 Find the probability that when a hand of 7 cards is drawn from a well shuffled deck of 52 cards, it contains (i) all kings (ii) 3 kings (iii) atleast 3 kings.

PART-D

IV Answer any SIX of the following: 6 x 5 = 30

39 Define greatest integer function. Draw its graph write its domain and range.

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

41 Using principle of mathematical induction that, $1^2 + 2^2 + 3^2 + \ldots\ldots + n^2 = \dfrac{n(n+1)(2n+1)}{6}$.

42 Solve the system of inequalities graphically : $3x+2y \leq 150,\quad x+4y \leq 80,\quad x \geq 0,\quad y \geq 0$

43 For all reals a, b and positive integer n, prove that, $(a+b)^n = {}^nC_0 a^n + {}^nC_1 a^{n-1}b + {}^nC_2 a^{n-2}b^2 + \text{------} + {}^nC_n b^n$

44 Derive an expression for the co-ordinates of a point that divides the line joining the points A (x_1, y_1, z_1) and B (x_2, y_2, z_2) internally in the ratio m:n. Hence find the co-ordinates of the midpoint of AB whose A = (1, 2, 3) and B = (5, 6, 7).

45 Derive angle between two lines with slopes m_1 and m_2 and θ is the angle between two lines is of the form

$\theta = \tan^{-1}\left|\dfrac{m_1 - m_2}{1 + m_1 m_2}\right|$.

46 For any positive integer n, prove that $\displaystyle\lim_{x \to a}\left(\dfrac{x^n - a^n}{x - a}\right) = na^{n-1}$.

47 A group consist 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) at least 3 girls?

48 Find the mean devation about mean for the following data.

Marks obtained	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Number of students	2	3	8	14	8	3	2

PART-E

V Answer any ONE of the following 1 x 10 = 10

49 a) Prove geomtrically that: $\cos(x+y) = \cos x \cos y - \sin x \sin y$. Hence deduce that

$\cos\left(\dfrac{\pi}{2} + x\right) = -\sin x$. **5**

 b) Find the sum to n terms of the series: $5 + 14 + 19 + 29 + 41 + \ldots\ldots$ **4**

50 a) Define Hyperbola. Derive its equation in the form $\dfrac{x^2}{a^2} - \dfrac{y^2}{b^2} = 1$. **6**

 b) Find the derivative of $\dfrac{x^2 \cos\left(\dfrac{\pi}{4}\right)}{\sin x}$ w.r.t x. **4**

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