JAIN COLLEGE V V Puram **I PUC Mock Paper – January. 2025**	**Course:** I PUC **Subject:** Mathematics **Max.Marks:** 70 **Duration:** 3:00 hr

I. Answer ALL the multiple-choice questions **1 x 15 = 15**

1. If $A=\{x: x=3n+1, 2\le x\le 5\}$, then number of subsets of A is
   a. 4 b. 16 c. 8 d. 32
2. If $f(x)=\dfrac{x^2-3x+1}{x-1}$, then $f(-2)+f\left(\dfrac{1}{3}\right)=$
   a. 1 b. 3/11 c. 2 d. -11/3
3. The central angle of a sector of circle of area 9πsq.cm is 60^0, the perimeter of the sector is
   a. π b. 3+π c. 6+π d. 6
4. The value of $\sqrt{-25}+3\sqrt{-4}+2\sqrt{-9}$ is
   a. $15i$ b. $-15i$ c. $17i$ d. $-17i$
5. The solution set for $-(x-3)<5-2x$
   a. $(-\infty,2)$ b. $(-\infty,-2)$ c. $(-\infty,5)$ d. $(-\infty,2]$
6. In a party, every person shakes hands with every other person. If there are 105 handshakes, how many people are present in the party?
   a. 10 b. 15 c. 14 d. 21
7. The sum of terms in the expansion of $(x+a)^{10}+(x-a)^{10}$ is
   a. 22 b. 6 c. 21 d. 11
8. If $-\dfrac{2}{7}, x, -\dfrac{7}{2}$ are in G.P., then the common ratio is
   a. 1 b. ±1 c. 2 d. ±2
9. A line passes through (2,2) and is perpendicular to the line 3x+y=3 and its intercept is
   a. 1/3 b. 2/3 c. 4/3 d. 1
10. In which quadrant the parabola $x^2=-4ay$ doesn't exist is
    a. I , II b. II, III c. III, IV d. I, IV
11. The eccentricity of the ellipse $9x^2+25y^2=225$ is
    a. 3/ 4 b. 4/5 c. 9/16 d. 3/5
12. The octant in which the point (-1,-3,-6) lie is
    a. V b. VI c. VII d. VIII
13. The value of $\lim\limits_{x\to 3}\dfrac{x^4-81}{2x^2-5x-3}$
    a. $\dfrac{7}{108}$ b. ∞ c. $\dfrac{108}{7}$ d. 0
14. The median of the data 3,9,5,3,12,10,18,4,7,19,21 is
    a. 10 b. 11 c. 9 d. 9.5
15. In a simultaneous throw of a pair of dice, the probability of getting 8 as sum is
    a. 5/36 b. 1/9 c. 1/12 7/36

II. Fill in the blanks by choosing the appropriate answer from those given in the bracket. 5 x 1 = 5
(2, 3, 1, -1, 5, 0)

16. If U={1,2,3,4,5,6,7,8} and A={2,4,6}, the n(A') is _____
17. If $x+3 \geq 2x+1$, when x is a natural number. The number of values of x is _____
18. If ${}^{12}C_r = {}^{12}C_{2-r}$ then r _____
19. The value of y for which the points (1,y),(2,1) and (4,5) are collinear will be _____
20. The derivative of f(x)=3x-3 at x=1 is _____

PART B

Answer any SIX questions: 6 x 2 =12

21. If A={2,4,6,8,10}, B={4,6,8} and c={2,4,8}, find A∩(B-C)
22. The minute hand of a watch is 1.5cm long. How far does its tip move in 40 minutes?
23. Prove that $\sin^2 \frac{\pi}{6} + \cos^2 \frac{\pi}{3} - \tan^2 \frac{\pi}{4} = -\frac{1}{2}$
24. If $x+iy = \frac{a+ib}{a-ib}$, prove that $x^2 + y^2 = 1$
25. Determine the number of 5 card combinations out of a deck of 52 cards if there is exactly one ace in each combination.
26. Using binomial theorem evaluate $(101)^4$.
27. how many terms of G.P. 3, 3^2, 3^3,… are needed to give the sum 120?
28. find the equation of the circle with centre (1,1) and radius $\sqrt{2}$
29. Three coins are tossed once. Find the probability of getting at least two heads.

PART C

Answer any SIX questions: 6 x 3 = 18

30. If U={1,2,3,4,5,6,7,8}, A={2,3,5,7} and B={2,4,6,8} verify $(A \cup B)' = A' \cap B'$
31. Determine the domain and range of the relation R defined by $R = \{(x, y) : 3x - y = 0, x, y \in A\}$ where A={1,2,3,….,14}
32. Show that $\cos 2x = \frac{1-\tan^2 x}{1+\tan^2 x}$
33. Find the modulus of $\frac{1+i}{1-i} - \frac{1-i}{1+i}$
34. the longest side of triangle is 3 times the shortest side and the third side is 2cm shorter than the longer side. If the perimeter of the triangle is at least 61cm, find the minimum length of the shortest side.
35. Evaluate $(\sqrt{2}+1)^4 + (\sqrt{2}-1)^4$
36. Find the equation of the line through the point (2,2) and cutting off intercepts on axes whose sum is 9.
37. Show that the points A(1,2,3), B(-1,-2,-1), C(2,3,2) and D(4,7,6) are vertices of parallelogram and not of rectangle,.
38. Find the derivative of sinx w.r.t x from first principles.

PART D

Answer any FOUR questions: **4 x 5 = 20**

39. Define modulus function. Draw the graph of it. Also write its domain and range.

40. Prove that $\frac{\sin 5x - 2\sin 3x + \sin x}{\cos 5x - \cos x} = \tan x$

41. A group consists of 4 girls and 7 boys. In how many ways can a team of 5 members be selected if team has (i)no girl (ii)at least one boy and one girl.

42. Derive the expression for the perpendicular distance between the point (x_1,y_1) and a line Ax+By+C=0

43. Prove geometrically $\lim_{x \to o} \frac{\sin x}{x} = 1$

44. Find the variance and standard deviation for the following data:

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

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

PART E

Answer the following question.

46. Prove geometrically $\cos(x + y) = \cos x \cos y - \sin x \sin y$ and hence prove that $\cos 75^0 = \frac{\sqrt{3} - 1}{2\sqrt{2}}$

OR **6**

Define ellipse and derive the equation of ellipse in standard form as $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

47. Find the derivative of $f(x) = \frac{x^5 - \cos x}{\sin x}$ with respect to x.

OR **4**

Find the sum of the series up to n terms 3+33+333+……..