**JAIN COLLEGE, Bangalore**
**Mock Paper January - 2016**
**I PUC – Mathematics (35)**

**Time: 3 Hours 15 Minutes** **Max. Marks: 100**

**PART A**

**I. Answer all ten of the following questions** **10 × 1 = 10**

1. List the elements of the following set $B=\{x: x \text{ is an integer}, \frac{-1}{2}<x<\frac{9}{2}\}$
2. If (x+1,y-2)=(3,1), Find the values of x and y.
3. Find the value of $\tan\frac{19\pi}{3}$.
4. Solve $\sqrt{5}x^2+x+\sqrt{5}=0$
5. How many 3digit numbers can be formed by using the digits 1 to 9 if no digit is repeated?
6. Find the 20th term of the G.P $\frac{5}{2},\frac{5}{4},\frac{5}{8},$.....
7. Find the equation of line through (-2,3) with slope -4.
8. Given $f(x)=\begin{cases}\frac{x}{|x|} & ,x\neq 0\\ 0, & x=0\end{cases}$ Find $\lim_{x\to 0^+} f(x)$
9. Write the statement in the form of "p if and only if q"
   "For you to get an A grade,it is neccessary and sufficient that you do all the homework regularly."
10. A die is thrown repeatedly untill a six comes up.What is the sample space for this experiment?

**PART B**

**II. Answer any ten of the following questions** **10 × 2 = 20**

11. If X and Y are two sets such that n(X)=17,n(Y)=23 and $n(X\cup Y)=38$,Find $n(X\cap Y)$
12. If A and B are two sets such that $A\subset B$ then what is $A\cup B$?
13. Find the domain and range of $f(x)=-|x|$
14. Find the general solution of sinx+sin3x+sin5x=0
15. Prove that $2\sin^2\frac{3\pi}{4}+2\cos^2\frac{\pi}{4}+2\sec^2\frac{\pi}{3}=10$
16. Find the multiplicative inverse of 4-3i
17. Solve the inequality $3(x-1)\leq 2(x-3)$
18. Find the equation of a line parallel to the line 3x-4y+2=0 and passing through the point (-2,3).
19. Find the distance of the points (3,-5) from the line 3x-4y-26=0.
20. Show that the points (-2,3,5),(1,2,3) and (7,0,-1) are collinear.
21. Find the derivative of $f(x)=\frac{x+1}{x}$
22. By giving a counter example, Show that the following statement is not true.
    "The equation $x^2-1=0$ does not have a root lying between 0 and 2."
23. Find the mean deviation about the mean for the following data
    3,9,5,3,12,10,18,4,7,19,21.

24. A letter is chosen at random from the word ASSASSINATION. Find the probability that letter is a consonant.

**PART C**

**III. Answer any ten of the following questions** **10 × 3 = 30**

25. If X and Y are two sets such that X has 40 elements. $X \cup Y$ has 60 elements and $x \cap Y$ has 10 elements, how many elements does Y have?
26. Find the domain of the function $f(x) = \dfrac{x^2 + 3x + 5}{x^2 - 5x + 4}$
27. If $\cot x = \dfrac{-5}{12}$ , x lies in second quadrant. Find the values of other five trigonometric functions.
28. If $x + iy = \dfrac{a + ib}{a - ib}$ Prove that $x^2 + y^2 = 1$
29. Express the following in the form of a+ib

    $(-5i)\left(\dfrac{1i}{8}\right)$
30. Determine n if $2nC_3 : nC_3 = 11:1$
31. Find the term independent of x in the expansion of $\left(\sqrt[3]{x} + \dfrac{1}{2\sqrt[3]{x}}\right)^{18}, x \neq 0$
32. Insert two numbers between 3 and 81 such that the resulting sequence is G.P.
33. In A.M and G.M of two positive numbers a and b are 10 and 8 respectively. Find the numbers.
34. Find the equation of the hyperbola where foci are $(0, \pm 2)$ and the length of the latus rectum is 36.
35. Evaluate $\lim\limits_{x \to 3} \dfrac{x^4 - 81}{2x^2 - 5x - 3}$
36. By giving a counter example, Show that the following statement is false
    "If n is an odd integer, then n is prime."
37. There are four men and six women on the city council. If one council member is selected for a committee at random, how likely is it that it is a women?
38. One die of red colour,one of white colour and one of blue colour are placed in a bag.one die is selected at random and rolled,its colour and the number on its uppermost face is noted.Describe the sample space.

**PART D**

**IV. Answer any six of the following questions** **6 × 5 = 30**

39. Let $A = \{1,2,3\}, B = \{3,4\}$ *and* $C = \{4,5,6\}$ Find $(A \times B) \cup (A \times C)$
40. Prove $\dfrac{\sin 5x + \sin 3x}{\cos 5x + \cos 3x} = \tan 4x$
41. Prove by using the principle of mathematical induction $10^{2n-1} + 1$ is divisible by 11.
42. Solve the system of inequalities graphically

    $3x + 2y \leq 150, x + 4y \leq 80, x \leq 15, y \geq 0, x \geq 0$
43. In how many ways of the distinct permutations of the letters in MISSISSIPPI do the four I's not come together?
44. For real numbers a,b and positive integer Prove that

    $(a+b)^n = nc_0 a^n + nc_1 a^{n-1} b + nc_2 a^{n-2} b^2 + \ldots\ldots\ldots\ldots\ldots + nc_n b^n$

45. 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 $\frac{1}{p^2}=\frac{1}{a^2}+\frac{1}{b^2}$

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

47. Compute the derivative of sin x by first principle

48. Find the mean deviation about median for the following data

| Marks | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 |
|---|---|---|---|---|---|---|
| No of girls | 6 | 8 | 14 | 16 | 4 | 2 |

**PART E**

**V. Answer any one of the following questions. 1 × 10 = 10**

49. a) Prove geometrically that cos(A+B)=cosAcosB-sinAsinB

b) Find the sum of the n terms $1^2+(1^2+2^2)+(1^2+2^2+3^2)+\ldots\ldots\ldots\ldots\ldots$

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

b) Evaluate $\lim_{x\to\pi}\left[\frac{\sin(\pi-x)}{\pi(\pi-x)}\right]$