



JAIN COLLEGE, Bangalore
Mock Paper December - 2017
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. Write the solution set of the equation $x^2 + x - 2 = 0$ in roster form.
2. If $\left(\frac{x}{3} + 1, y - \frac{2}{3}\right) = \left(\frac{5}{3}, \frac{1}{3}\right)$. Find the values of x and y.
3. Convert 25° into radian measure.
4. Express i^{-39} in the form of a+ ib.
5. Evaluate $\frac{n!}{(n-r)!}$ when n=9, r=5.
6. Find a_7 if $a_n = \frac{n^2}{2^n}$
7. Find the distance between parallel lines $3x - 4y + 7 = 0$ and $3x - 4y + 5 = 0$
8. Evaluate $\lim_{x \rightarrow 0} \frac{\sin ax}{\sin bx}$, $a, b \neq 0$.
9. Write the negation of the statement "Both the diagonals of a rectangle have the same length."
10. Define mutually exclusive event.

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 $U=\{1,2,3,4,5,6,7,8,9\}, A=\{2,4,6,8\}$ and $B=\{2,3,5,7\}$. Verify that $(A \cap B)^c = A^c \cup B^c$
13. Find the domain and range of the real function $f(x) = \sqrt{9 - x^2}$
14. The minute hand of a watch is 1.5cm long. How far does its tip move in 40minutes?(use $\pi = 3.14$)
15. Find the principal and general solution of $\tan x = \sqrt{3}$
16. Find the multiplicative inverse of $2 - 3i$
17. Solve the inequality $3(2 - x) \geq 2(1 - x)$
18. Find the angle between the lines $\sqrt{3}x + y = 1$ and $x + \sqrt{3}y = 1$
19. Find the equation of the line parallel to the line $3x-4y+2=0$ and passing through the point $(-2,3)$.
20. Show that the points $P(-2,3,5), Q(1,2,3)$ and $R(7,0,-1)$ are collinear.
21. Evaluate $\lim_{x \rightarrow 3} \frac{x^4 - 81}{2x^2 - 5x - 3}$
22. Write the converse and contrapositive of "A positive integer is prime only if has no divisors other than 1 and itself."
23. Coefficient of variation of two distributions is 60 and 70 and their standard deviations are 21 and 16 respectively. What are their arithmetic means?
24. On her vacations Veena visits four cities A,B,C and D in random order. What is the probability that she visits A before B?

PART C

III. Answer any ten of the following questions

10 × 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. Define a relation R on the set of natural numbers by
 $R = \{(x, y) : y = x + 5; x \text{ is a natural number less than } 4; x, y \in \mathbb{N}\}$.Write down its domain and range.
27. Prove that $\cot^2 \frac{\pi}{6} + \operatorname{cosec} \frac{5\pi}{6} + 3 \tan^2 \frac{\pi}{6} = 6$
28. Convert the complex number $\frac{-16}{1+i\sqrt{3}}$ in the polar form.
29. Solve the equation $\sqrt{3}x^2 - \sqrt{2}x + 3\sqrt{3} = 0$
30. Find the value of 'n' such that ${}^n p_5 = 42 {}^n p_3, n > 4$
31. Find the coefficient of $x^6 y^3$ in the expansion of $(x + 2y)^9$
32. The sum of first three term of a G.P is 16 and the sum of the next three terms is 128.Determine the first term and common ratio.
33. Find the sum of all natural numbers lying between 100 and 1000 which are multiples of 5.
34. Find the coordinates of the foci ,eccentricity and length of the latus rectum of the ellipse $\frac{x^2}{36} + \frac{y^2}{16} = 1$
35. Find the derivative of 'tan x' with respect to x using first principle.
36. Verify the method of contradiction that ' $\sqrt{2}$ is irrational.'
37. One card is drawn from a well shuffled deck of 52 cards. If each outcome is equally likely, Calculate the probability that the card will be 1)a diamond 2)an ace and 3)a black card.
38. Given $P(A) = \frac{3}{5}, P(B) = \frac{1}{5}$. Find $P(A \text{ or } B)$, if A and B are mutually exclusive events.

PART D

IV. Answer any six of the following questions

6 × 5 = 30

39. Define a modulus function. Find its domain and range. Also draw its graph.
40. Prove that $\cos 2x \cdot \cos \frac{x}{2} - \cos 3x \cdot \cos \frac{9x}{2} = \sin 5x \cdot \sin \frac{5x}{2}$.
41. Prove by mathematical Induction that $1.2.3 + 2.3.4 + 3.4.5 + \dots + n(n+1)(n+2) = \frac{n(n+1)(n+2)(n+3)}{4}$
42. Solve the following system of inequalities graphically $2x + y \geq 4, x + y \leq 3, 2x - 3y \leq 6$
43. 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) at least one boy and one girl and 3)at least 3girls.
44. For all real numbers a, b and positive integer 'n', Prove that $(a + b)^n = {}^n C_0 a^n + {}^n C_1 a^{n-1} b^1 + {}^n C_2 a^{n-2} b^2 + \dots + {}^n C_n b^n$
45. If p and q are the lengths of the perpendiculars from the origin to the lines $x \cos \theta - y \sin \theta = k \cos 2\theta$ and $x \sec \theta + y \operatorname{cosec} \theta = k$ respectively .Prove that $p^2 + 4q^2 = k^2$

46. Derive an expression of the coordinates 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 $m: n$.
47. Prove that $\lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta} = 1$ where θ is in radian.
48. Find the mean deviation about 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

PART E

V. Answer any one of the following questions.

1 × 10 = 10

49. a) Prove geometrically that $\cos(x + y) = \cos x \cdot \cos y - \sin x \cdot \sin y$
 b) Find the sum of the following up to 'n' series $5 + 55 + 555 + 5555 + \dots$
50. a) Define Ellipse as a set of points. Derive its equation in the form $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$
 b) Find the derivative of $\frac{x + \cos x}{\tan x}$ with respect to 'x'.
