

Model Question Paper – 4
I P.U.C MATHEMATICS (35)

Time : 3 hours 15 minute

Max. Marks : 100

Instructions :

- (i) The question paper has five parts namely A, B, C, D and E. Answer all the parts.
- (ii) Use the graph sheet for the question on inequalities in PART E.

PART-A

ANSWER ALL THE QUESTIONS

1X10=10

1. Write the set $\{x: x \in \mathbb{R} \text{ and } -4 < x \leq 6\}$ as an interval.
2. If $A = \{1, 2\}$, $B = \{3, 4\}$ then show that $A \times (B \cap \emptyset) = \emptyset$.
3. If $\cos x = -3/5$, x lies in the IIIrd quadrant then find the value of $\sin x$.
4. Evaluate: $i^{24} + \left(\frac{1}{i}\right)^{26}$
5. Find the number of 4 digits that can be formed using the digits 1, 2, 3, 4, 5. If no digit is repeated.
6. Which term of $2, 2\sqrt{2}, 4, \dots$ is 128.
7. Reduce $6x + 3y - 5 = 0$ into slope-intercept form.
8. Find $\lim_{x \rightarrow 5} |x| - 5$
9. Write the negation of "Every natural number is greater than zero".
10. If $2/11$ is the probability of an event A then what is the probability of the event 'not A'?

PART-B

ANSWER ANY TEN QUESTIONS

2X10=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 $(A \cap B)' = A' \cup B'$
12. If X and Y are two sets such that $X \cup Y$ has 50 elements, X has 28 elements and Y has 32 elements. How many elements does $X \cap Y$ have?
13. If $A = \{1, 2\}$ and $B = \{3, 4\}$ write $A \times B$. How many subsets will $A \times B$ have?
14. The minute hand of a clock is 1.5cm long. How far does its tip move in 40 Minute? (Use $\pi = 3.142$)
15. Prove that $\sin 3x = 3\sin x - 4\sin^3 x$.
16. If $x + iy = \frac{p+iq}{p-iq}$ prove that $x^2 + y^2 = 1$.
17. Solve the inequality $(2x-5) > (1-5x)$ and represent the solution graphically on the number line.
18. By using the concept of equation of the line prove that the three points (3,0), (-2,-2) and (8,2) are collinear.

19. Find the equation of the line parallel to the line $3x-4y+2=0$ and passing through the point $(-2,3)$.
20. Find the ratio in which the YZ-plane divides the line segment formed by joining the points $(-2,4,7)$ and $(3,-5,8)$.
21. Compute the derivative of $\sin^2 x$.
22. By giving a counter example, show that the following statements is false: "If n is an odd integer then n is a prime".
23. The mean and variance of heights of XI students are 162.6cm and 127.69cm^2 respectively. Find the C.V.
24. A card is selected from a pack of 52 parts calculate the probability that the card is i)an Ace ii)a black card.

PART-C

ANSWER ANY TEN QUESTIONS

3X10=30

25. In a survey of 400 students in a school, 100 were listed as taking apple juice, 150 as taking orange juice and 75 were listed as taking both apple and orange juices. Find how many students were taking neither apple juice nor orange juice.
26. If $f(x)=x^2$ and $g(x)=2x+1$ be two real functions find i) $(f+g)(x)$ ii) $(f-g)(x)$ iii) $(fg)(x)$
27. Find the general solution of $\sec^2 2x=1-\tan 2x$.
28. Express $\frac{1-i}{1+i}$ into polar form.
29. Solve: $2x^2+\sqrt{3}x-1=0$.
30. If ${}^4P_r = 6 \cdot {}^5P_{r-1}$ then find r .
31. Find the coefficient of x^5 of $(x+3)^8$.
32. Insert five number between 8 and 26 such that resulting sequence is an A.P.
33. The sum of first three terms of a G.P. is $13/12$ and their product is -1 . Find the common ratio and the terms.
34. Find the equation of parabola with vertex at the origin, axis along x-axis and passing through the point $(2,3)$ also find its focus.
35. Differentiate: $(x+1/x)$ from first principle.

PART-D

ANSWER ANY SIX QUESTIONS

5X6=30

36. Verify by the method of contradiction that $\sqrt{7}$ is irrational.
37. A bag contains 9 discs of which 4 are red 3 are blue and 2 are yellow. The discs are similar in shape and size. The disc is drawn at random from the bag. Calculate the probability that will be
(i)red (ii) no blue (iii) either red or blue.
38. A and B are events such that $P(A)=1/4$, $P(B)=1/2$ and $P(A \text{ and } B)=1/8$. Find (i) $P(A \text{ or } B)$ (ii) $P(\text{not } A \text{ and not } B)$
39. Define Signum function. Draw the graph of it and write down its Domain and Range.

40. Prove that $\cos 2x \cos \frac{x}{2} - \cos 3x \cos \frac{9x}{2} = \sin 5x \sin \frac{5x}{2}$
41. Prove that $10^{2n-1} + 1$ is divisible by 11, $\forall n \in \mathbb{N}$ by the principle of mathematical Induction.
42. Solve the following system of linear inequalities graphically.
 $x + y \geq 5, x - y \leq 3.$
43. Find the number of ways of selecting 9 balls from 6 red balls, 5 white balls and 5 blue balls. If each selection consists of 3 balls of each colour.
44. Prove Binomial Theorem for positive integers with real numbers. Hence prove that
 ${}^n C_0 + {}^n C_2 + {}^n C_4 + \dots = {}^n C_1 + {}^n C_3 + {}^n C_5 + \dots$
45. P(a,b) is the midpoint of the line segment between axes. Show that the equation of the line is $\frac{x}{a} + \frac{y}{b} = 2$
46. Derive the formulae for distance between two points (x_1, y_1, z_1) and (x_2, y_2, z_2) and hence find the distance between P(1,-3,4) and Q(-4,1,2).
47. Prove that $\lim_{x \rightarrow 0} \frac{\sin x}{x} = 1$, where x is in radian and hence evaluate: $\lim_{x \rightarrow 0} \frac{\sin 4x}{\sin 2x}$
48. The mean and standard deviation of 100 observations were evaluated as 40 and 5.1 respectively. By a student who took by mistake, 50 instead of 40 for one observation. What are correct mean and standard deviation.

PART -E

ANSWER ANY ONE QUESTION:

1x10=10

- 49 a) Define ellipse as a set of all points in the plane and derive its equation in the standard form as $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1, a > b.$ 6
- b) Find the derivative of $\frac{2}{x+1} - \frac{x^2}{3x-1}$ 4
- 50 a) Prove geometrically that
 $\cos(x + y) = \cos x \cos y - \sin x \sin y$
 and hence show that $\cos\left(\frac{\pi}{2} + x\right) = -\sin x.$ 6
- b) Find the sum to n terms of series: $\frac{1}{1.2} + \frac{1}{2.3} + \dots$ 4