

First PUC Annual Examination, January - February - 2019

Time : 3-15 Hrs.

Subject - Mathematics (35)

Max. Marks : 100

Instructions

1. The question paper has five parts namely A, B, C, D, and E. Answer all parts
2. Use the graph sheet for the question on inequalities in Part - D

PART - A

I Answer ALL the questions

10x1=10

1. Write the set $\{x : x \in \mathbb{R} \text{ \& } -4 < x \leq 6\}$ as an interval
2. Let $A = \{1, 2\}$ and $B = \{3, 4\}$. Find the number of relations from sets A to B
3. Convert $\frac{7\pi^c}{6}$ into degree measure
4. Find the conjugate of $\sqrt{3}i - 1$
5. Find 'n' if $n_{C_7} = n_{C_6}$
6. Write the first three terms of the sequence $a_n = (-1)^{n-1} 5^{n+1}$
7. Find the slope of the line $\frac{x}{3} + \frac{y}{2} = 1$
8. Evaluate : $\lim_{x \rightarrow 0} \frac{\cos x}{\pi - x}$
9. Write the negation of "For every real number x, x is less than x + 1"
10. If $\frac{2}{11}$ is the probability of an event 'A'. What is the probability of the event 'not A'?

PART - B

II Answer any TEN questions.

10x2=20

11. If $U = \{x : x \leq 10, x \in \mathbb{N}\}$
 $A = \{x : x \in \mathbb{N} \text{ and } x \text{ is prime}\}$
 $B = \{x : x \in \mathbb{N}, x \text{ is even}\}$
find $A \cap B$ in roster form.
12. If X & Y are the two sets such that $n(x) = 17$, $n(y) = 23$ & $n(X \cup Y) = 38$ Find $n(X \cap Y)$
13. The cartesian product $A \times A$ has 9 elements among which are found $(-1, 0)$ & $(0, 1)$. Find the set A & the remaining elements of $A \times A$
14. A wheel makes 360 revolutions in one minutes through how many radians does it turn in 1 second.
15. If $\sin A = \frac{3}{5}$ & A is in I quadrant then find $\sin 2A$.
16. Express $i^{18} + \left(\frac{1}{i}\right)^{25}$ in $a + ib$ form
17. Solve $3x - 2 < 2x + 1$ & represent the solution graphically on the number line.
18. Find the equation of the straight line intersecting y - axis at a distance of 2 units above the origin & making an angle 30° with the positive direction of x - axis.
19. Find the angle between the lines $y - \sqrt{3}x - 5 = 0$ & $\sqrt{3}y - x + 6 = 0$
20. Show that the points P $(-2, 3, 5)$ Q $(1, 2, 3)$ & R $(7, 0, -1)$ are collinear
21. Evaluate $\lim_{x \rightarrow 3} \frac{x-3}{x^2-5x+6}$
22. Write the converse & contrapositive of the statement "If s is prime number then x is odd"
23. The co-efficient of variation & standard deviation are 60 & 21 respectively. What is the arithmetic mean of the distribution.
24. Given $P(A) = \frac{3}{5}$ & $P(B) = \frac{1}{5}$. Find $P(A \text{ or } B)$. if A & B are mutually exclusive events.

PART - C

III Answer any TEN questions

10x3=30

25. In a group of 600 students in a school 150 students were found to be taking tea, 225 taking coffee, 100 were taking both tea & coffee. How many students were taking neither tea nor coffee?

26. Let $A = \{1, 2, 3, \dots, 14\}$ Define a relation R from A to A by $R = \{(x, y) : 3x - y = 0, x, y \in A\}$ Write its relation 'R' in roster form, write its Domain & Range.
27. Find the general solution of $2\cos^2 x + 3\sin x = 0$
28. Express $\frac{-1+i}{\sqrt{2}}$ in the polar form
29. Solve the equation $x^2 + \frac{x}{\sqrt{2}} + 1 = 0$
30. How many words with or without meaning can be made from the letters of the word 'MONDAY' assuming that no letter is repeated. If
i) 4 letters are used at a time
ii) All letters are used at a time
iii) All letters are used but first letter is a vowel
31. Find the term independent of x in the expansion of $\left(\frac{3x^2}{2} - \frac{1}{3x}\right)^6$
32. The sum of first three terms of a G. P. is $\frac{13}{12}$ & their product is -1 . Find the common ratio & the terms.
33. Insert 3 arithmetic means between 8 & 24.
34. Find the equation of parabola with vertex at the origin, axis along x - axis & passing through the point (2, 3) also find its focus.
35. Find the derivative of the function 'cosx' w. r. t. x from first principle.
36. Verify by the method of contradiction that $\sqrt{2}$ is an 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 (i) diamond (ii) not an ace (iii) a black card
38. A fair coin 1 marked on one face & 6 on the other face & a fair die are both tossed. Find the probability that the sum of numbers that turn up (i) 3 (ii) 12

PART - D

IV Answer any SIX questions

6x5=30

39. Define signum function. Draw the graph of it & write down its domain & Range
40. Prove that $\frac{\cos 4x + \cos 3x + \cos 2x}{\sin 4x + \sin 3x + \sin 2x} = \cot 3x$
41. Prove by mathematical induction $1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$
42. Solve graphically the system of inequation $x + 2y \geq 20, 3x + y \leq 15$
43. A group consists of 4 girls & 7 boys, In how many ways can a team of 5 members be selected, if the team has "at least one boy & one girl?"
44. State and prove Binomial Theorem for positive integral index 'n'
45. Find the co-ordinates of the foot of the perpendicular from the point (-1, 3) to the line $3x - 4y - 16 = 0$
46. Derive an expression for the Co-ordinates of a point that divides the line joining the points A (x_1, y_1, z_1) & B (x_2, y_2, z_2) internally in the ratio $m : n$ & hence find the mid point of (1, 2, 3) & 5, 6, 7)
47. Prove that $\lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta} = 1$ (θ is measured in radian) & hence evaluate $\lim_{\theta \rightarrow 0} \frac{\sin a\theta}{\sin b\theta}$
48. Find the mean deviation about the 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 question

1x10=10

49. a) Prove geometrically that $\cos(x+y) = \cos x \cos y - \sin x \sin y$
b) Find the derivative of $\frac{x^5 - \cos x}{\sin x}$ w. r. t. x
50. a) Define ellipse & derive its equation in the form $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ ($a > b$)
b) Find the sum to n terms of the series $3 \times 8 + 6 \times 11 + 9 \times 14 + \dots$

