

First PUC Annual Examination, February - 2020

Time : 3-15 Hrs.

Subject - Mathematics (35)

Max. Marks : 100

General Instructions

1. The question paper has five parts, namely A, B, C, D and E. Answer all the parts.
2. Part-A carries 10 marks, Part-B carries 20 marks, Part-C carries 30 marks Part-D carries 30 marks and Part-E carries 10 marks.
3. Write the question number properly as indicated in the question paper.
4. Use the graph sheet for the question on linear inequalities in part-D

Part - A

10 x 1 = 10

I Answer ALL the following questions.

1. Write the power set of the set $A = \{a, b\}$
2. Find range of the function $f(x) = \sqrt{9 - x^2}$
3. Convert 300° in to radian measure
4. Find the modulus of complex number $2 - 5i$
5. If $n_{c_8} = n_{c_2}$ find n ?
6. If n^{th} term of sequence is $a_n = \frac{n^2}{2^n}$ then find 7th term
7. Find the slope of the line passing through the points (3, -2) and (7, -2)
8. Evaluate $\lim_{x \rightarrow 1} [x^3 - x^2 + 1]$
9. Write the negation of the statement " $\sqrt{2}$ is a rational number"
10. Define "Event" of a random experiment.

Part - B

10 x 2 = 20

II Answer any TEN of the following questions

11. Let $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $A = \{1, 2, 3, 4\}$ and $B = \{3, 4, 5, 6\}$ Find $(A \cup B)'$
12. Are the pair of sets equal? If $A = \{2, 3\}$ $B = \{x : x \text{ is solution of } x^2 + 5x + 6 = 0\}$
13. Let $f : \mathbb{R} \rightarrow \mathbb{R}$ and $g : \mathbb{R} \rightarrow \mathbb{R}$ defined by $f(x) = x + 1$, $g(x) = 2x - 3$. Find $(f + g)(x)$ and $(f \cdot g)(x)$
14. Find the radius of the circle in which a central angle of 60° intercepts an arc of length 37.4 cm. use $\left(\pi = \frac{22}{7}\right)$
15. Find the value of $\cos 75^\circ$
16. Find the multiplicative inverse of $\sqrt{5} + 3i$
17. Solve $7x + 3 < 5x + 9$. Show the graph of the solutions on the number line.
18. Find the equation of line perpendicular to the line $x - 2y + 3 = 0$ and passing through the point (1, -2)
19. Find the distance between the parallel lines $3x - 4y + 7 = 0$ and $3x - 4y + 5 = 0$
20. Are the points A (3, 6, 9), B (10, 20, 30) and C (25, -41, 5) the vertices of a right angled triangle?
21. Evaluate $\lim_{x \rightarrow 2} \left[\frac{x^3 - 4x^2 + 4x}{x^2 - 4} \right]$
22. Write the converse and contrapositive of "If two lines are parallel then they do not intersect in the same plane."
23. Find the mean of the data 6, 7, 10, 12, 13, 4, 8, 12
24. Given $P(A) = 0.5$, $P(B) = 0.35$ and $P(A \cup B) = 0.7$. Find $P(A \cap B)$

Part - C

III Answer any TEN of the following questions

10 x 3 = 30

25. In a class of 35 students, 24 like to play cricket and 16 like to play foot ball. Also each student likes to play at least one of the two games. How many students like to play both cricket and foot ball?
26. Determine the domain and range of the relation R defined by $R = \{(x, x + 5) : x \in \{0, 1, 2, 3, 4, 5\}\}$
27. Find the general solutions of $\cos 4x = \cos 2x$
28. Reduce the complex number $\sqrt{3} + i$ in to polar form
29. Solve the equation $\sqrt{2}x^2 + x + \sqrt{2} = 0$
30. How many words with or without meaning can be made from the letters of the word MONDAY assuming that no letters is repeated. If
 - (i) 4 letters are used at a time
 - (ii) All the letters are used at a time
 - (iii) All the letters are used but first letter is vowel

31. Find the term independent of x in the expansion of $\left(\frac{3x^2}{2} - \frac{1}{3x}\right)^6$, $x \neq 0$
32. If the sum of three terms in A. P. is 24 and their product is 440. Find the numbers.
33. Which term of the sequence $\frac{1}{3}, \frac{1}{9}, \frac{1}{27}, \dots$ is $\frac{1}{19683}$?
34. Find the focus, equation of directrix and length of latus rectum of the parabola $y^2 = -8x$
35. Find the derivative of $\sin x$ with respect to x from first principles.
36. Verify by the method of contradiction that " $\sqrt{7}$ is irrational"
37. Consider the experiment of rolling a die. Let A be the event "getting a prime number". B be the event "getting an odd number" write the sets representing the events (i) A or B (ii) A and B (iii) A but not B (iv) not A .
38. A committee of two persons is selected from two men and two women, what is the probability that committee will have (a) No man? (b) one man?

Part - D

IV Answer any SIX of the following questions.

6 x 5 = 30

39. Define modulus function. If the function $f: \mathbb{R} \rightarrow \mathbb{R}$ is defined by $f(x) = |x|$ draw the graph of the function write the domain and range of f . ($\mathbb{R}$ is the set of real numbers)
40. Prove that $\frac{\sin x - 2\sin 3x + \sin x}{\cos 5x - \cos x} = \tan x$
41. Prove by mathematical induction $1^2 + 2^2 + 3^2 + 4^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6} \quad \forall n \geq 1, n \in \mathbb{N}$
42. Solve the inequalities graphically $3x + 4y \leq 60$, $x + 3y \leq 30$, $x \geq 0$, $y \geq 0$
43. What is the number of ways of choosing 4 cards from a pack of 52 playing cards? In how many of these (i) Four cards are of the same suit (ii) Four cards belong to four different suits (iii) Are face cards (iv) cards are of the same colour?
44. State and prove Binomial theorem for any positive integer
45. Derive the intercept form of straight line $\frac{x}{a} + \frac{y}{b} = 1$ where a and b are x and y intercepts respectively.
46. Find the co-ordinates of the point which divides the line segment joining the points $(1, -2, 3)$ and $(3, 4, -5)$ in the ratio 2 : 3 internally
47. Prove that $\lim_{x \rightarrow 0} \left(\frac{\sin x}{x}\right) = 1$ (x is in radians) and hence evaluate $\lim_{x \rightarrow 0} \left(\frac{\sin 4x}{\sin 2x}\right)$
48. Calculate the mean deviation about the median for the data

Class	0-10	10-20	20-30	30-40	40-50	50-60
Frequency	6	7	15	16	4	2

Part - E

V Answer any ONE of the following questions.

1 x 10 = 10

49. a. Prove geometrically that $\cos(x+y) = \cos x \cdot \cos y - \sin x \cdot \sin y$
b. Find the sum to n terms of the series $5 + 11 + 19 + 29 + 41 + \dots + n$ terms
50. a. Define ellipse as a set of points and derive the equation of the ellipse in the standard form

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1, (a > b)$$

b. Find the derivative of $y = \frac{x + \cos x}{\tan x}$

