

DEPARTMENT OF PRE-UNIVERSITY EDUCATION

MODEL QUESTION PAPER FOR ANNUAL EXAMINATION MARCH-2022

I PUC

SUB: MATHEMATICS (35)

TIME: 3 Hours 15 Minutes

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 Linear Inequalities in PART D.**

PART – A

Answer any TEN questions

10 X 1=10

1. Write the solution set of the equation $x^2 + x - 2 = 0$ in roaster form.
2. If the set A has 3 elements and the set $B = \{3, 4, 5\}$, then find the number of elements in $A \times B$.
3. Express the angle $\frac{7\pi}{6}$ in degree measure.
4. If $4x + i(3x - y) = 3 + i(-6)$, where x and y are real numbers, then find the values of x
5. Solve $24x < 100$, when x is a natural numbers.
6. Evaluate $7!$
7. Find the fourth term in the expansion of $(x - 2y)^{12}$.
8. If the n^{th} term of a sequence is $a_n = 4n - 3$; find a_{17} .
9. Find the slope of the line passing through the points (3,-2) and (-1,4).
10. Find the coordinates of the focus of the parabola $y^2 = 12x$.
11. If a point is in the XZ-plane, what is its y-coordinate?

12. Evaluate $\lim_{x \rightarrow 4} \frac{4x+3}{x-2}$

13. Write the negation of the statement “ Both the diagonals of a rectangle have the same length”

14. Find the mean of first n natural numbers.

15. Define the sample space of a random experiment.

PART- B

Answer any TEN questions

10 X 2=20

16. Write down all the subsets of the set $A = \{1, 2, 3\}$.

17. If $A = \{1, 2, 3, 4, 5, 6\}$, $B = \{2, 4, 6, 8\}$, find $A-B$ and $B-A$.

18. If $A = \{-1, 1\}$, find $A \times A \times A$.

19. Let $A = \{1, 2\}$ and $B = \{3, 4\}$, Find the number of relations from A to B.

20. In a circle of diameter 40cm, the length of a chord is 20cm. Find the length of minor arc of the chord.

21. Find the value of $\sin 75^\circ$.

22. Find the value of $\cos(-1710^\circ)$.

23. Express $(-5i) \cdot \frac{1}{8}i$ in the form $a+ib$.

24. Solve $7x + 3 < 5x + 9$. Show the graph of the solutions on number line.

25. How many 3-digit even numbers can be formed from the digits 1, 2, 3, 4, 5, 6 if the digits can be repeated?

26. If the equation of a line is $3x - 4y + 10 = 0$, find its slope and y-intercept.

27. Find the distance between the parallel lines $3x-4y+7=0$ and $3x-4y+5=0$

28. Find the distance between the points (2,3,5) and (4,3,1).

29. Evaluate $\lim_{x \rightarrow 0} \frac{(x+1)^5-1}{x}$

30. Find the derivative of $\sin x \cdot \cos x$ with respect to x.

31. Write the components of the statement “ Two lines intersect at a point or they are parallel”

32. The coefficient of variation of a distribution is 70 and standard deviation is 16. Find the arithmetic mean.

33. Given $P(A) = \frac{3}{5}$ and $P(B) = \frac{1}{5}$. Find $P(A \text{ or } B)$, if A and B are mutually exclusive events.

PART – C

Answer any TEN questions

10 X 3=30

34. If $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $A = \{2, 4, 6, 8\}$ and $B = \{2, 3, 5, 7\}$. Verify that

$$(A \cup B)' = A' \cap B'.$$

35. In a class of 35 students, 24 like to play cricket and 16 like to play football. Also, each student likes to play at least one of the two games. How many students like to play both cricket and football?

35. Let $A = \{1, 2, 3, \dots, 14\}$. Define a relation R from A to A by $R = \{(x, y) : 3x - y = 0, \text{ where } x, y \in A\}$. Write down its domain and range.

37. If $\cos x = \frac{-3}{5}$, x lies in the third quadrant. Find the values of other five trigonometric functions.

38. Find the multiplicative inverse of the complex number $4 - 3i$.

39. Solve $x^2 + x + \frac{1}{\sqrt{2}} = 0$.

40. Find the value of n such that ${}^n P_5 = 42 {}^n P_3$, $n > 4$

41. Find the coefficient of x^5 in the expansion of $(x + 3)^8$.

42. Insert 6 numbers between 3 and 24 such that the resulting sequence is an A.P.

43. The sum of first three terms of a G.P. is $\frac{13}{12}$ and their product is -1. Find the common ratio and the terms.

44. Find the equation of the hyperbola whose foci are $(\pm 5, 0)$, the transverse axis is of length 8.

45. Find the centre and radius of the circle $x^2 + y^2 - 4x - 8y - 45 = 0$.

46. Evaluate $\lim_{x \rightarrow 0} f(x)$ if it exists, where $f(x) = \begin{cases} \frac{|x|}{x}, & x \neq 0 \\ 0, & x = 0 \end{cases}$.

47. Find the derivative of $y = \sin x$ with respect to x, from the first principle.

48. Verify by the method of contradiction that “ $\sqrt{7}$ is irrational”.

49. Find the mean deviation about the median for the following data:
3,9,5,3,12,10,18,4,7,19,21.

50. A die is thrown. Describe the events A : ‘a number less than 7’.
B: ‘ a number greater than 7’. Find (i) AUB (ii) $A \cap B$

51. In class XI of a school 40% of the students study Mathematics and 30% study Biology. 10% of the class study both Mathematics and Biology. If a student is selected at random from the class, find the probability that he will be studying Mathematics or Biology.

PART –D

Answer any SIX questions

6X 5=30

52. Define Modulus function. Draw the graph of it. Also write its domain and range.

53. Prove that $\frac{\cos 4x + \cos 3x + \cos 2x}{\sin 4x + \sin 3x + \sin 2x} = \cot 3x$

54. Prove that $1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{n(n+1)(n+2)}{6}$ by principle of mathematical induction.

55. Convert the complex number $\frac{-16}{1+i\sqrt{3}}$ into polar form.

56. Solve the following system of linear inequalities graphically

$$x + 2y \leq 8, 2x + y \leq 2, x \geq 0, y \geq 0$$

57. 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

(i) at least one boy and one girl?

(ii) at least 3 girls?

58. Prove that for any positive integer n

$$(a+b)^n = {}^n C_0 a^n + {}^n C_1 a^{n-1} b + {}^n C_2 a^{n-2} b^2 + \dots + {}^n C_n b^n.$$

59. If arithmetic mean (A.M.) and Geometric mean (G.M.) of two positive numbers a and b are

10 and 8, respectively, find the numbers.

60. Derive the formula to find the distance of a point (x_1, y_1) from the line $Ax + By + C = 0$.

61. Derive the formula to find the co-ordinates of the point that divides the line joining the points (x_1, y_1, z_1) and (x_2, y_2, z_2) internally in the ratio m : n.

62. Prove geometrically that $\lim_{x \rightarrow 0} \frac{\sin x}{x} = 1$, where x is measured in radians.

63 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

Answer any ONE question

1 X 10=10

64. a) Prove that $\cos(x + y) = \cos x \cos y - \sin x \sin y$ and hence prove that

$$\cos\left(\frac{\pi}{2} - x\right) = \sin x.$$

(b) Find the sum to n terms of the series $1 \times 2 \times 3 + 2 \times 3 \times 4 + 3 \times 4 \times 5 + \dots$

65.

(a) Derive the formula to find the angle between two non-vertical lines with slopes m_1 and m_2 , respectively. Hence find the angle between the lines $y - \sqrt{3}x - 5 = 0$ and $\sqrt{3}y - x + 6 = 0$.

b) Prove that $\tan 3x = \frac{3\tan x - \tan^3 x}{1 - 3\tan^2 x}$.

66. (a) Define an Ellipse and derive its equation in the standard form $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.

(b) Find the derivative of $\frac{x^5 - \cos x}{\sin x}$ with respect to x.
