

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 all the questions.****10x1=10**

1. Define power of a set.
2. Let $A = \{1, 2\}$ & $B = \{3, 4\}$. Find the number of relations from A to B.
3. Convert 240° into radian measure.
4. Solve the equation $x^2 + 3 = 0$
5. Evaluate $7! - 5!$
6. Write the first three terms of the sequence $a_n = \frac{n-3}{4}$
7. Find the slope of the line $3x - 4y + 10 = 0$
8. Evaluate $\lim_{x \rightarrow 0} \left(\frac{\sin ax}{bx} \right)$
9. Write the negation of the statement $\sqrt{2}$ is not a complex number.
10. In the experiment of tossing a coin thrice. Describe the events 'exactly one head appeared'.

Part - B**Answer any TEN questions.****10x2=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 that $(A \cup B)^c = A^c \cap B^c$.
12. If X & Y are two sets such that $n(X) = 17$, $n(Y) = 23$ & $n(X \cap Y) = 38$, find $n(X \cup Y)$.
13. Find the domain and range of the real function $f(x) = \sqrt{9 - x^2}$.
14. Find the value of $\sin 75^\circ$.
15. A wheel makes 360 revolutions in one minute. Through how many radians does it turn in one second?
16. Express $\frac{1+3i}{1-2i}$ in the form of $a+ib$.
17. Solve $3x - 2 < 2x + 1$. Show the graph of the solutions on number line.
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 through the points $(1, -1)$ & $(3, 5)$
20. Find the distance between the points $(-3, 7, 2)$ and $(2, 4, -1)$
21. Evaluate $\lim_{x \rightarrow 2} \left(\frac{x^3 - 2x^2}{x^2 - 5x + 6} \right)$
22. Write the contrapositive and converse of the statement. If the two lines are parallel, then they do not intersect in the same plane.
23. Co-efficient of variation of a distribution is 70 and its standard deviation is 16 what is its arithmetic mean?

(P.T.O.)

24. 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) a diamond (ii) not an ace

Part - C

Answer any TEN questions.

10x3=30

25. In a class of 35 students, 24 like to play cricket and 16 like to play football. Also, each student like to play atleast one of the two games. How many students like to play both cricket & football?
26. Let $f: \mathbb{R} \rightarrow \mathbb{R}$ and $g: \mathbb{R} \rightarrow \mathbb{R}$ be defined by $f(x)=x+1$, $g(x)=2x-3$. Find $(f+g)(x)$, $(f-g)(x)$ and $\left(\frac{f}{g}\right)(x)$.
27. Find the general solution of the equation $\sin 2x + \cos x = 0$.
28. Convert the complex number $1 + i\sqrt{3}$ in the polar form.
29. Find the conjugate of $\frac{(3-2i)(2+3i)}{(1+2i)(2-i)}$
30. Find r , if $5^4 P_r = 6^5 P_{r-1}$
31. Using binomial theorem, compute $(98)^5$.
32. If the sum of a certain number of terms of A.P. 25, 19, is 116. Find the last term.
33. The sum of first three terms of a G.P. is $\frac{39}{10}$ and their product is 1. Find the common ratio and the terms.
34. Find the coordinates of the foci, eccentricity and length of the latus rectum of the hyperbola $\frac{x^2}{9} - \frac{y^2}{16} = 1$
35. Find the derivative of $\sin x$ from first principle.
36. Verify by the method of contradiction $P: \sqrt{5}$ is irrational.
37. If E & F are events such that $P(E) = \frac{1}{4}$, $P(F) = \frac{1}{2}$ and $P(E \text{ and } F) = \frac{1}{8}$
Find (i) $P(E \text{ or } F)$ (ii) $P(\text{not } E \text{ and not } F)$
38. 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. A disc is drawn at random from the bag. Calculate the probability that it will be (i) red (ii) yellow (iii) blue

Part - D

Answer any SIX questions.

6x5=30

39. Define a modulus function. Draw the graph and 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 using mathematical induction $1^3 + 2^3 + 3^3 + \dots + n^3 = \frac{n^2(n+1)^2}{4}$, $\forall n \in \mathbb{N}$.
42. Solve the inequalities graphically, $x + 2y \leq 8$, $2x + y \leq 8$, $x \geq 0$, $y \geq 0$
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
(i) no girl? (ii) at least one boy and one girl?
(iii) at least three girls?

44. State and prove Binomial theorem for all the integers.
45. Derive the equation of a straight line having the intercepts 'a' & 'b' on the X and Y - axes respectively. Hence find the equation of the line with intercepts -3 & 2 on the X and Y - axes respectively.
46. Derive an expression for 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 $\lim_{\theta \rightarrow 0} \left(\frac{\sin \theta}{\theta} \right) = 1$, where θ is in radian and hence show that $\lim_{\theta \rightarrow 0} \left(\frac{\tan \theta}{\theta} \right) = 1$.
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

Answer any ONE questions.

1x10=10

49. a) Prove Geometrically that $\cos(x+y) = \cos x \cos y - \sin x \sin y$ and hence show that $\cos 2x = \cos^2 x - \sin^2 x$ 6
- b) Find the sum of the series,
7, 77, 777, 7777, to n terms. 4
50. a) Define ellipse as set of all points in the plane and derive its equation as $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$. 6
- b) Find the derivative of $\frac{x + \cos x}{\tan x}$ 4