Time: 3 hours 15 minute   **Max Marks :**

Instructions:
1) The question paper has five parts namely A,B,C,D and E. Answer all the parts.
2) Section A has 10 MCQ's, 5 Fill in the blanks and 5 Very Short Answer questions of 1 mark each.
3) The sub question I and II of Part A should be answered continuously at one or two page. Only first answer is considered for the marks in sub question I and II of Part A.
4) Use the graph sheet for question on liner inequality in PART D.

PART A

I. Answer All the Multiple Choice Questions $10 \times 1 = 10$

1. $(A \cap B) \cup (A - B)$ is.

a) B   b) $A \cup B$ c) A   d) $\emptyset$

2. Let n(A)=3, n(B)=2, then the number of relations from A to B is

a) 64   b) 8   c) 9   d) 32

3. Domain of secx is

a) R   b) R-(-1,1)   c) R-$\{x:x \neq n\pi, n \in Z\}$ d) R-$\{x:x \neq (2n+1)\frac{\pi}{2}, n \in Z\}$

4. Find the additive inverse of a+ib is

a) $-a+ib$ b) a+ib   c) a-ib   d) $-a-ib$

5. $nC_r + nC_{r-1}$ is

a) nC_{r+1} b) $(n+1)C_{r+1}$ c) $n+1C_r$ d) $n+1C_{r-1}$

6. Let the sequence a_n be defined as $a_1 = 1$, $a_n = a_{n-1} + 2$, then the 3rd term of the sequence is

a) 3   b) 7   c) 5   d) 9

7. The angle between the x-axis and the line joining the points (3,-1) and (4,-2) is

a) 45^0 b) 135^0 b) 120^0 d) 225^0

8. $\lim_{x \to 1} \frac{x^{15}-1}{x^{10}-1}$ is

a) $\frac{3}{2}$ b) $\frac{2}{3}$ c) $\frac{14}{9}$ d) $\frac{9}{14}$

9. Which of the following is a statement?

a) Mathematics is difficult   b) Answer this question

c) Today is windy day   d) The product of (-1) and 8 is 8

10. If A and B are mutually exclusive events and P(A)=$\frac{3}{5}$ and P(B)=$\frac{1}{5}$, then P(A or B) is

a)   b) 3/25   c) 3/5   d) 1/5

II. Fill in the blanks by choosing the appropriate answer from those given in the bracket.

(0,1,3,4,5)   5 × 1 = 5

11. Let E be an event of a Sample Space S, then $P(E) + P(E')$ is ----------------

12. Length of the transverse axis of the hyperbola $\frac{x^2}{4} - \frac{y^2}{9} = 1$ is ----------------

13. The number of terms in the expansion of $(x+a)^4$ is ---------

14. The point (-3, 2, -5) lies in------------------thoctant.

15. The derivative of $f(x)=3x^2-27x+5$, at $x=5$ is ----------------

III.   Answer all the following questions   5 × 1 = 5

16. Find the radian measure of the angle 240^0.

17. Solve $7x+3<5x+9$ when x is a real number.

18. Write roster form of the set $\{x: x$ is an integer and $-3 \le x < 1\}$.

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

20. Find the value of value of 7!-5!.

PART B

IV. Answer any NINE Questions   9 × 2 = 18

21. Let A={1,2,3,4,5,6}, B={2,4,5,6,8}. Find A-B and B-A.

22. Let U={1,2,3,4,5,6}, A={2,3} and B={3,4,5}. Find $A' \cap B'$.

23. If A = {1, 2, 3}, B ={3, 4} and C = {4, 5, 6}. Find $A \times (B \cup C)$.

24. Find the radius of the circle in which a central angle of 60^0 intercepts an arc of length 37.4 cm

$$\left(use \ \pi = \frac{22}{7} \right)$$

25. If $cosx = -\frac{3}{5}$, x lies in the third quadrant, find the values of sinx and tanx.

26. Express $(1-i)^4$ in a+ib form.

27. The marks obtained by a student of Class XI in first and second terminal examination are

62 and 48, respectively. Find the minimum marks he should get in the annual examination to have an
average of at least 60 marks.

28. Find the equation of the line which cuts off equal intercepts on the coordinate axes and passes through
the point (2,3).

29. Find the equation of the line parallel to the line 3x-4y+2 = 0 and passing through the point (-2,3)

30. ...that the points P(-2,3,5), Q(1,2,3) and R(7,0,-1) are collinear.

31. Evaluate $\lim_{x \to 2}\left[\frac{x^3 - 2x^2}{x^2 - 5x + 6}\right]$

32. Write converse and contrapositive of the statement

'If a number is divisible by 9, then it is divisible by 3'.

33. Coefficient of variation of a distribution is 60 and the standard deviation is 21. Find the arithmeticMean.

34. An experiment involves rolling a die. Let A: a number less than 4appearsB: a number greater than 4 appears. Show that the events A and B are mutually exclusiveevents.

PART C

V. Answer any NINE Questions

$9 \times 3 = 27$

35. If X and Y are two sets such that X ∪ Y has 50 elements, X has 28 elements and Y has 32 elements, how many elements does X ∩ Y have?

36. Let $A = \{1, 2, \cdots, 14\}$. 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, codomain and range.

37. Find the General Solution of sin2x+cosx=0.

38. Represent the complex number $z = 1 + i\sqrt{3}$ in the polar form.

39. Solve the equation $2x^2 + x + 1 = 0$.

40. In how many of the distinct permutations of the letters of the word MISSISSIPPI dothe fourI's do not come together?

41. Show that the middle term in the expansion of$(1 + x)^{2n}$ is $\frac{1.3.5\ldots\ldots(2n-1)}{n!}$ $2nx^n$.

42. Find the sum of all natural numbers lying between 100 and 1000, which are multiples of 5.

43. Find the sum of the sequence 7,77,777,7777, ...to n terms.

44. Find the coordinates of the focus, the equation of the directrix and latus rectum of the parabola
$$y^2 = -8x.$$

45. Find the derivative of sinx from First Principle.

46. By contradiction method prove that $\sqrt{7}$ is irrational.

47. Three coins are tossed once. Find the probability of getting
(i) at least 2 heads   (ii) no head.

48. 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) not blue (iii) either red or blue.

PART D

$5 \times 5 = 25$

49. Define Modulus function. Draw the graph of Modulus function and write its domain and range.

50. Prove that $\dfrac{\sin 5x - 2\sin 3x + \sin x}{\cos 5x - \cos x} = \tan x$.

51. Prove by Mathematical Induction that $1^2 + 2^2 + 3^2 + \text{---------------} + n^2 = \dfrac{n(n+1)(2n+1)}{6}$. $\forall n \in N$.

52. Solve the following system of inequalities graphically
$x + 2y \leq 8$ -------- (1), $2x + y \leq 8$---------- (2), $x \geq 0$------- (3) ,$y \geq 0$--------(4).

53. 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) two are red cards and two are black cards,
   iv) cards are of the same colour?

54. State and Prove Binomial Theorem for any positive integer n.

55. Derive the formula to find the distance of a Point $P(x_1, y_1)$ from a Line Ax+By+C=0.

56. Derive the formula to find the coordinates of a point which divides the line segment joining the points $P(x_1, y_1, z_1)$ and $Q(x_2, y_2, z_2)$ internally in the ratio m : n.

57. Prove that $\lim_{x \to 0} \dfrac{\sin x}{x} = 1$, where x is measured in radian measure.

58. 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

VII. Answer the following questions

59. Prove geometrically that cos(x+y) = cosxcosy-sinxsiny.

OR

(6)

Derive the equation of the ellipse in the form $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} = 1$.

60. Find the derivative of $\dfrac{x^5 - \cos x}{\sin x}$ with respect to x.

OR

(4)

Find the sum to n terms of the series $1 \times 2 + 2 \times 3 + 3 \times 4 + 4 \times 5 + \text{------------------}$