QUESTION BANK

I PU MATHEMATICS

DEPARTMENT OF PRE UNIVERSITY EDUCATION

CONTENTS

CHAPTER-1

SETS

ONE MARK QUESTIONS:

1. Is the collection of all the months of a year beginning with the letter J a set? Justify your answer. (U)

2. Is the collection of ten most talented writers of India a set? Justify your answer. (U)

3. Is the collection of all boys in your class a set? Justify your answer. (U)

4. Is the collection of all natural numbers less than 100 a set? Justify your answer. (U)

5. Is the collection of all even integers a set? Justify your answer. (U)

6. Is the collection of all most dangerous animals of the world a set? Justify your answer. (U)

7. Is the following pairs of sets are equal?Justify your answer.
A = $\{n: n \in \mathbb{Z}, and\ n^2 \leq 4\}$ and B =$\{x: x \in \mathbb{R}\ and\ x^2 - 3x + 2 = 0\}$. (U)

8. State whether the set of lines which are parallel to the x-axis is finite or infinite. (U)

9. State whether A = B or not, where A = $\{2, 4, 6, 8, 10\}$ and B = $\{x: x\ is\ positive\ even\ integer\ and\ x\ \leq 10\}$. (U)

10. Are the sets $\{1, 2, 3, 4\}$and $\{x: x\ is\ a\ natural\ number\ and\ 4 \leq x \leq 6\}$ disjoint? (U)

11. State whether the following statement is true or false. Justify your answer.
$\{a, e, i\ o, u\}$and$\{a, b, c, d\}$ are disjoint sets. (U)

12. Write the set $\{x: x\ is\ a\ positive\ integer\ and\ x^2 < 40\}$ in roster form. (U)

13. Write the set A = $\{1, 4, 9, 16, 25, \cdots\}$ in the set-builder form. (U)

14. Write the set $\left\{\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \frac{5}{6}, \frac{6}{7}\right\}$ in the set-builder form. (U)

15. Write the set $\{x: x\ is\ an\ integer\ and\ x + 1 = 1\}$ in roster form. (U)

16. Write the set $\{x: x\ is\ a\ positive\ integer\ and\ is\ a\ divisor\ of\ 18\}$ in roster form. (U)

17. Write the set$\{x: x\ is\ an\ integer\ and\ x^2 - 9 = 0\}$ in roster form. (U)

18. Write the set$\{x: x\ is\ a\ integer\ and - 3 < x < 7\}$ in roster form. (U)

19. Write the set$\{x: x\ is\ a\ natural\ number\ less\ than\ 6\}$ in roster form. (U)

20. Write the set$\{x: x\ is\ a\ two\ digit\ natural\ number\ such\ that\ the\ sum\ of\ its\ digits\ is\ 8\}$ in roster form. (U)

21. Write the set $\{x: x\ is\ a\ prime\ number\ which\ is\ a\ divisor\ of\ 60\}$ in roster form. (U)

22. Write the set of all letters in the word TRIGONOMETRY in roster form. (U)

23. Write the set of all letters of the word BETTER in roster form. (U)

24. Write the set $\{3, 6, 9, 12\}$ in the set-builder form. (U)

25. Write the set $\{2, 4, 8, 16, 32\}$ in the set-builder form. (U)

26. Write the set $\{5, 25, 125, 625\}$ in the set-builder form. (U)

27. Write the set $\{2, 4, 6, \cdots\}$ in the set-builder form. (U)

28. Write the set $\{1, 4, 9, \cdots, 100\}$ in the set-builder form. (U)

29. Write the set $A = \{x: x \text{ is an odd natural number}\}$ in roster form. (U)

30. Write the set A = $\left\{x: x \text{ is an integer}, -\frac{1}{2} < x < \frac{9}{2}\right\}$ in roster form. (U)

31. Write the set A = $\{x: x \text{ is an integer}, x^2 \leq 4\}$ in roster form. (U)

32. Write the set A = $\{x: x \text{ is a letter in the word } LOYAL\}$ in roster form. (U)

33. Write the set A = $\{x: x \text{ is a month of a year not having } 31 \text{ days}\}$ in roster form. (U)

34. Write the set A = $\{x: x \text{ is a consonant in the English alphabet which preceds } k\}$ in roster form. (U)

35. Write the set A = $\{x: x \text{ is a prime number and a divisor of } 6\}$ in roster form. (U)

36. Write the set A = $\{x: x \text{ is an odd natural number less than } 10\}$ in roster form. (U)

37. Write the set A = $\{x: x \text{ is a ntural number and divisor of } 6\}$ in roster form. (U)

38. Write the set A = $\{x: x \text{ is a letter of the word } MATHEMATICS\}$in roster form. (U)

39. Define an empty set. (K)

40. Define a finite set. (K)

41. Define equal sets. (K)

42. Define a subset of a set. (K)

43. Define power set of a set. (K)

44. Write down all the subsets of the set $\{a\}$. (U)

45. Write down all the subsets of the set $\{a, b\}$. (U)

46. Write down all the subsets of the set $\emptyset$. (U)

47. How many elements has P(A), if A = $\emptyset$? (U)

48. Write the set $\{x: x \in R, -4 < x \leq 6\}$ as an interval. (U)

49. Write the set $\{x: x \in R, -12 < x < -10\}$ as an interval. (U)

50. Write the set$\{x: x \in R, 0 \leq x < 7\}$ as an interval. (U)

51. Write the set$\{x: x \in R, 3 \leq x \leq 4\}$ as an interval. (U)

52. Write the interval (-3, 0) in the set-builder form. (U)

53. Write the interval $[6, 12]$ in the set-builder form. (U)

54. Write the interval$(6, 12]$ in the set-builder form. (U)

55. Write the interval $[-23, 5)$ in the set-builder form. (U)

56. Define union of two sets. (K)

57. Let A = $\{2, 4, 6, 8\}$ and B = $\{6, 8, 10, 12\}$. Find AUB. (U)

58. Let A = $\{a, e, i\ o, u\}$ and B = $\{a, i, u\}$. Find AUB. (U)

59. Let X = $\{Ram, Geeta, Akbar\}$ be the set of students of class XI, who are in school hockey team. Let Y = $\{Geeta, David, Ashok\}$ be the set of students from class XI who are in the school football team. Find XUY. (A)

60. Define intersection of two sets. (K)

61. Let A = $\{2, 4, 6, 8\}$ and B =$\{6, 8, 10, 12\}$. Find A∩B. (U)

62. Let X = $\{Ram, Geeta, Akbar\}$ be the set of students of class XI, who are in school hockey team. Let Y = $\{Geeta, David, Ashok\}$ be the set of students from class XI who are in the school football team. Find X∩Y. (A)

63. If A = $\{x: x\ is\ a\ natural\ number\}$ and B = $\{x: x\ is\ an\ even\ natural\ number\}$, find $A \cap B$. (U)

64. If A = $\{x: x\ is\ a\ natural\ number\}$ and B = $\{x: x\ is\ an\ odd\ natural\ number\}$, find $A \cap B$. (U)

65. If A = $\{x: x\ is\ a\ natural\ number\}$ and B = $\{x: x\ is\ prime\ number\}$, find $A \cap B$. (U)

66. If A = $\{x: x\ is\ an\ even\ natural\ number\}$ and B = $\{x: x\ is\ an\ odd\ natural\ number\}$, find $A \cap B$. (U)

67. If A = $\{x: x\ is\ a\ even\ natural\ number\}$ and B = $\{x: x\ is\ a\ prime\ number\}$, find $A \cap B$. (U)

68. If A = $\{x: x\ is\ a\ odd\ natural\ number\}$ and B = $\{x: x\ is\ a\ prime\ number\}$, find $A \cap B$. (U)

69. Find the union of the sets A = $\{x: x\ is\ a\ natural\ number\ and\ multiple\ of\ 3\}$ and

B = $\{x: x\ is\ a\ natural\ number\ less\ than\ 6\}$. (U)

70. Find the union of the sets A = $\{x: x\ is\ a\ natural\ number\ and\ 1 < x \leq 6\}$ and

B = $\{x: x\ is\ a\ natural\ number\ and\ 6 < x < 10\}$. (U)

71. Find the intersection of the sets A = $\{x: x\ is\ a\ natural\ number\ and\ multiple\ of\ 3\}$ and

B = $\{x: x\ is\ a\ natural\ number\ less\ than\ 6\}$. (U)

72. Find the intersection of the sets A = $\{x: x\ is\ a\ natural\ number\ and\ 1 < x \leq 6\}$ and

B = $\{x: x\ is\ a\ natural\ number\ and\ 6 < x < 10\}$. (U)

73. Let A = $\{1,2,3,4,5,6,7,8,9,10\}$ and B = $\{2,3,5\}$. Find A∩B. (U)

74. Find the union of the sets X = $\{1,3,5\}$ and Y = $\{1,2,3\}$. (U)

75. Find the union of the sets A = $\{a,e,i,o\ u\}$ and B = $\{a,b,c\}$. (U)

76. Find the union of the sets A = $\{1,2,3\}$ and B = ∅. (U)

77. If A and B are two sets such that A⊂B, then what is AUB? (U)

78. If A = $\{1,2,3,4\}$, B = $\{3,4,5,6\}$ and C = $\{5,6,7,8\}$, find AUBUC. (U)

79. If A = $\{1,2,3,4\}$, B = $\{3,4,5,6\}$ and C =$\{7,8,9,10\}$ find AUBUC. (U)

80. Find the intersection of the sets X = $\{1,3,5\}$ and Y = $\{1,2,3\}$. (U)

81. Find the intersection of the sets A = $\{a,e,i,o\ u\}$ and B = $\{a,b,c\}$. (U)

82. Find the intersection of the sets A = $\{1,2,3\}$ and B = ∅. (U)

83. If R is the set of real numbers and Q is the set of rational umbers, then what is R – Q? (U)

84. Define complement of a set. (K)

85. Let U = $\{1,2,3,4,5,6,7,8,9,10\}$ and A = $\{1,3,5,7,9\}$. Find A'. (U)

86. Let U be the universal set of all students of class XI of a coeducational school and A be the set of all girls in class XI. Find A'. (A)

87. Let U = $\{a,b,c,d,e,f,g,h\}$, find the complement of the set A = $\{a,b,c\}$. (U)

88. Let U = $\{a,b,c,d,e,f,g,h\}$, find the complement of the set A = $\{d,e,f,g\}$. (U)

89. Let U = $\{a,b,c,d,e,f,g,h\}$, find the complement of the set A = $\{a,c,e,g\}$. (U)

90. Let U = $\{a,b,c,d,e,f,g,h\}$, find the complement of the set A = $\{f,g,h,a\}$. (U)

91. Let U be the set of all triangles in a plane. If A is the set of all triangles with at least one angle different from 60^o, what is A'? (A)

TWO MARKS QUESTIONS:

1. Write down all the subsets of the set $\{1,2,3\}$. (U)

2. Write the solution set of the equation $x^2 + x - 20 = 0$ in roster form. (U)

3. Let A = $\{1,2,3,4,5,6\}$, B = $\{2,4,6,8\}$. Find A – B and B – A. (U)

4. Let A = $\{a,b\}$, B = $\{a,b,c\}$. Is A ⊂ B? What is AUB? (U)

5. If A = $\{3,5,7,9,11\}$, B = $\{7,9,11,13\}$ and C = $\{11,13,15\}$, find $A \cap (B \cup C)$. (U)

6. If A = $\{3,5,7,9,11\}$, B = $\{7,9,11,13\}$ and C = $\{15,17\}$, find $A \cap (B \cup C)$. (U)

7. If A = $\{3,6,9,12,15,18,21\}$ and B = $\{4,8,12,16,20\}$, find A – B and B – A. (U)

8. If A = $\{3, 6, 9, 12, 15, 18, 21\}$ and B = $\{2, 4, 6, \ 8, 10, 12, 14, 16\}$, find A – B and B – A. (U)

9. If A = $\{3, 6, 9, 12, 15, 18, 21\}$ and B = $\{5, 10, 15, 20\}$, find A – B and B – A. (U)

10. If A = $\{2, 4, 6, 8, 10, 12, 14, 16\}$ and B = $\{4, 8, 12, 16, 20\}$, find A – B and B – A. (U)

11. If A = $\{4, 8, 12, 16, 20\}$ and B = $\{5, 10, 15, 20\}$, find A – B and B – A. (U)

12. If A = $\{2, 4, 6, 8, 10, 12, 14, 16\}$ and B = $\{5, 10, 15, 20\}$, find A – B and B – A. (U)

13. If X = $\{a, b, c, d\}$ and Y = $\{b, d, g, f\}$ find X – Y and Y – X. (U)

14. If X = $\{a, b, c, d\}$ and Y = $\{b, d, g, f\}$ find X – Y and X∩Y. (U)

15. Let U = $\{1, 2, 3, 4, 5,6, 7, 8, 9\}$, A = $\{1, 2, 3, 4\}$ and B = $\{2, 4, 6, 8\}$, find $(A \cup B)'$. (U)

16. Let U = $\{1, 2, 3, 4, 5,6, 7, 8, 9\}$, A = $\{1, 2, 3, 4\}$ and B = $\{3, 4, 5, 6\}$, find $(A \cup B)'$. (U)

17. Let U = $\{1, 2, 3, 4, 5,6, 7, 8, 9\}$, A = $\{1, 2, 3, 4\}$ and B = $\{3, 4, 5, 6\}$, find $(A - B)'$. (U)

18. If A = $\{3, 5, 7, 9, 11\}$, B = $\{7, 9, 11, 13\}$, C = $\{11, 13, 15\}$ and D = $\{15, 17\}$, find $(A \cap B) \cup (C \cup D)$.(U)

19. If A = $\{3, 5, 7, 9, 11\}$, B = $\{7, 9, 11, 13\}$, C = $\{11, 13, 15\}$ and D = $\{15, 17\}$, find $(A \cup B) \cap (C \cup D)$.(U)

20. Taking the set of natural numbers as the universal set, write the complements of the following sets:
i) $\{x: x \text{ is an even natural number}\}$, ii) $\{x: x \text{ is a positive multiple of } 3\}$. (U)

21. Taking the set of natural numbers as the universal set, write the complements of the following sets:
i) $\{x: x \text{ is an odd natural number}\}$, ii) $\{x: x \text{ is a prime number}\}$. (U)

22. Taking the set of natural numbers as the universal set, write the complements of the following sets:
i) $\{x: x \text{ is a natural number divisible by } 3 \text{ and } 5\}$, ii) $\{x: x \text{ is a perfect square}\}$. (U)

23. Taking the set of natural numbers as the universal set, write the complement of the following sets:
i) $\{x: x \text{ is a perfect cube}\}$, ii) $\{x: x + 5 = 8\}$. (U)

24. Taking the set of natural numbers as the universal set, write the complement of the following sets:
i) $\{x: 2x + 5 = 9\}$, ii) $\{x: x \geq 7\}$. (U)

25. Taking the set of natural numbers as the universal set, write the complement of the following sets:
i) $\{x: x \in N \text{ and } 2x + 1 > 10\}$, ii) $\{x: x \in N \text{ and } x \geq 8\}$ (U)

26. Draw the appropriate Venn diagram for $A' \cap B'$. (U)

27. Draw the appropriate Venn diagram for $(\mathrm{A} \cap \mathrm{B})'$. (U)

28. Draw the appropriate Venn diagram for $\mathrm{A}' \cup \mathrm{B}'$. (U)

29. Draw the appropriate Venn Diagram for $(\mathrm{A} \cup \mathrm{B})'$. (U)

30. If A and B are finite sets, then prove that $n(A \cup B) = n(A) + n(B) - n(A \cap B)$. (S)

31. If X and Y are sets such that XUY has 50 elements, X has 28 elements and Y has 32 elements, how many elements does X ∩Y have? (U)

32. If X and Y are sets such that n(X) = 17, n(Y) = 23 and n(XUY) = 38, find n(X∩Y). (U)

33. If X and Y are sets such that XUY has 18 elements, X has 8 elements and Y has 15 elements, how many elements does X∩Y have? (U)

34. If S and T are two sets such that S has 21 elements, T has 32 elements and S∩T has 11 elements, how many elements does S ∪ T have? (U)

35. If X and Y are sets such that X has 40 elements, XUY has 60 elements and X∩Y has 10 elements, how many elements does Y have? (U)

36. In a school there are 20 teachers who teach mathematics or physics. Of these, 12 teach mathematics and 4 teach physics and mathematics. How many teach physics? (U)

37. 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? (U)

38. There are 200 individuals with skin disorder, 120 had been exposed to the chemical C_1, 50 to chemical C_2 and 30 to both the chemicals $C_1$and C_2. Find the number of individuals exposed to chemical C_1 but not chemical C_2. (A)

39. There are 200 individuals with skin disorder, 120 had been exposed to the chemical C_1, 50 to chemical C_2 and 30 to both the chemicals $C_1$and C_2. Find the number of individuals exposed to chemical C_2 but not chemical C_1. (A)

40. There are 200 individuals with skin disorder, 120 had been exposed to the chemical C_1, 50 to chemical C_2 and 30 to both the chemicals $C_1$and C_2. Find the number of individuals exposed to chemical C_1 or chemical C_2. (A)

41. In a group of 400 people, 250 can speak Hindi and 200 can speak English also each person can speak at least one of the languages. How many people can speak both Hindi and English? (U)

42. In a group of 70 people, 37 like coffee, 52 like tea and each person likes at least one of the two drinks. How many people like both coffee and tea? (U)

43. In a committee, 50 people speak French, 20 speak Spanish and 10 speak both Spanish and French. How many speak at least one of these two languages? (U)

44. Show that the set of letters to spell "CATARACT" and the set of letters to spell "TRACT" are equal. (U)

45. List all the subsets of the set $\{-1, 0, 1\}$. (U)

46. Show that AUB = $A \cap B$ implies A = B. (S)

47. Determine whether the following statement is true or false. If it is true, prove it. If it is false, give an example to prove that it is false."If $x \in A$and $A \in B$, then $x \in B$" (S)

48. Determine whether the following statement is true or false. If it is true, prove it. If it is false, give an example to prove that it is false.
"If $A \subset B$and $B \in C$, then $A \in C$" (S)

49. Determine whether the following statement is true or false. If it is true, prove it. If it is false, give an example to prove that it is false.
"If $A \subset B$and $B \subset C$, then $A \subset C$" (S)

50. Determine whether the following statement is true or false. If it is true, prove it. If it is false, give an example to prove that it is false.
"If $A \not\subset B$and $B \not\subset C$, then $A \not\subset C$" (S)

51. Determine whether the following statement is true or false. If it is true, prove it. If it is false, give an example to prove that it is false.
"If $x \in A$and $A \not\subset B$, then $x \in B$" (S)

52. Determine whether the following statement is true or false. If it is true, prove it. If it is false, give an example to prove that it is false.
"If $A \subset B$and $x \notin B$, then $x \notin A$" (S)

53. Using properties of sets, Show that $A \cup (A \cap B) = A$. (S)

54. Using properties of sets, Show that $A \cap (A \cup B) = A$. (S)

55. Show that $A \cap B = A \cap C$ need not imply B = C. (S)

THREE MARKS QUESTIONS:

1. Let U =$\{1, 2, 3, 4, 5, 6\}$, $A = \{2, 3\}$ and B = $\{3, 4, 5\}$. Show that $(A \cup B)' = A' \cap B'$. (U)

2. Let U =$\{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $A = \{2, 4, 6, 8\}$ and B = $\{2, 3, 5, 7\}$. Show that $(A \cup B)' = A' \cap B'$.(U)

3. Let U =$\{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $A = \{2, 4, 6, 8\}$ and B = $\{2, 3, 5, 7\}$. Show that $(A \cap B)' = A' \cup B'$.(U)

4. If A, B and C are finite sets, then prove that $n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(B \cap C) - n(A \cap C) + n(A \cap B \cap C)$. (S)

5. In a survey of 400 students in a school, 100 were listed as taking apple juice, 150 as taking orange juice and 75 were listed as taking both apple as well as orange juice. Find how many students were taking neither apple juice nor orange juice. (A)

6. In a group of 65 people, 40 like cricket, 10 like both cricket and tennis also each person likes at least one of the games. How many like tennis only and not cricket? How many like tennis? (A)

7. For any two sets A and B, show that P(A∩B) = P(A)∩P(B). (S)

8. A market research group conducted a survey of 1000 consumers and reported that 720 consumers like product A and 450 consumers like product B, what is the least number that must have liked both products? (A)

9. Out of 500 car owners investigated, 400 owned car A and 200 owned car B, 50 owned both A and B cars. Is this data correct? (A)

10. A college awarded 38 medals in football, 15 in basketball and 20 in cricket. If these medals went to a total of 58 men and only three men got medals in all the three sports, how many received medals in exactly two of the three sports? (A)

11. Let A, B and C be the sets such that $A \cup B = A \cup C$ and $A \cap B = A \cap C$. Show that $B = C$. (S)

12. Show that the conditions $A \subset B$ and $A - B = \emptyset$ are equivalent. (S)

13. Show that the conditions $A \subset B$ and $A \cup B = B$ are equivalent. (S)

14. Show that the conditions $A \subset B$ and $A \cap B = A$ are equivalent. (S)

15. Show that if $A \subset B$, then $(C - B) \subset (C - A)$. (S)

16. Assume that P(A) = P(B). Show that A = B. (S)

17. Is it true that for any two sets A and B, P(A) U P(B) = P(AUB)? Justify your answer. (S)

18. Show that for any two sets A and B, $A = (A \cap B) \cup (A - B)$ (S)

19. Show that for any two sets A and B, $A \cup (B - A) = A \cup B$. (S)

20. Let A and B be sets. If $A \cap X = B \cap X = \emptyset$ and $A \cup X = B \cup X$ for sum set X, show that A = B. (S)

21. Find sets A, B and C such that $A \cap B, B \cap C$ and $A \cap C$ are non empty sets and $A \cap B \cap C = \emptyset$. (S)

22. In a survey of 600 students in a school, 150 students were found to be taking tea and 225 taking coffee,

100 were taking both tea and coffee. Find how many students taking neither tea nor coffee? (A)

23. In a group of students, 100 students know Hindi, 50 know English and 25 know both. Each of the students

knows either Hindi or English. How many students are there in the group? (A)

24. In a survey of 60 people, it was found that 25 people read newspaper H, 26 read newspaper T, 26 read newspaper I, 9 read both H and I, 11 read both H and T, 8 read both T and I, 3 read all three newspapers. Find number of people who read at least one of the newspapers. (A)

25. In a survey of 60 people, it was found that 25 people read newspaper H, 26 read newspaper T, 26 read newspaper I, 9 read both H and I, 11 read both H and T, 8 read both T and I, 3 read all three newspapers. Find number of people who read exactly one newspaper. (A)

26. In a survey it was found that 21 people liked product A, 26 liked product B and 29 liked product C. If 14 people liked products A and B, 12 people liked products C and A, 14 people liked products B and C and 8 liked all the three products. Find how many liked product C only. (A)

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CHAPTER-2

RELATIONS AND FUNCTIONS

ONE MARK QUESTIONS:

1. Define Cartesian product of two nonempty sets. (K)

2. If the set A has 3 elements and the set B = $\{3, 4, 5\}$, then find the number of elements in $(A \times B)$.(U)

3. Define a relation. (K)

4. Define domain of a relation. (K)

5. Define range of a relation. (K)

6. A = $\{1, 2, 3, 5\}$ and B = $\{4, 6, 9\}$. Define a relation R from A to B by

R = $\{(x, y): the\ difference\ between\ x\ and\ y\ is\ odd; x \in A, y \in B\}$. Write R in roster form. (U)

7. Define a function. (K)

8. The function 't' which maps temperature indegree Celsius into temperature in degree Fahrenheit is defined by $t(C) = \frac{9C}{5} + 32$. Find the value of C, when $t(C) = 212$. (A)

9. Find the range of the function $f(x) = 2 - 3x, x \in \mathbb{R}, x > 0$. (U)

10. Find the range of the function $f(x) = x^2 + 2,\ x$ is a real number. (U)

11. Find the range of the function $f(x) = x,\ \ x$ is a real number. (U)

12. Find the domain of the function $f(x) = \frac{x^2+2x+1}{x^2-8x+12}$ (U)

13. If (x + 1, y -2) = (3, 1), find the values of x and y. (U)

14. If P = $\{m, n\}$ and Q = $\{n, m\}$, form the set P×Q. (U)

15. Find the domain of the function $f(x) = \frac{x^2+3x+5}{x^2-5x+4}$ (U)

TWO MARKS QUESTIONS:

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

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

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

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

5. If P = $\{1, 2\}$, form the set $\mathrm{P} \times \mathrm{P} \times \mathrm{P}$. (U)

6. If $A \times B = \{(p, q), (p, r), (m, q), (m, r)\}$, find A and B. (U)

7. If $\left(\frac{x}{3} + 1, y - \frac{2}{3}\right) = \left(\frac{5}{3}, \frac{1}{3}\right)$, find the values of x and y. (U)

8. If $G = \{7, 8\}$ and $H = \{5, 4, 2\}$, find $G \times H$and $H \times G$. (U)

9. If A = $\{-1, 1\}$, find $A \times A \times A$. (U)

10. If A×B = $\{(a, x), (a, y), (b, x), (b, y)\}$. Find A and B. (U)

11. Let A = $\{1, 2, 3 ,4, 5, 6\}$. Define a relation R from A to A by R = $\{(x, y): y = x + 1\}$. Write down the domain and range of R. (U)

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

13. Write the relation R = $\{(x, x^3): x\ is\ a\ prime\ number\ less\ than\ 10\}\ in\ roster\ form$. (U)

14. Let A = $\{x, y, z\}$ and B = $\{1, 2\}$. Find the number of relations from A to B. (S)

15. State whether the relation R = $\{(2, 2), (2, 4), (3, 3), (4, 4)\}$ is a function or not. Justify your answer. (U)

16. State whether the relation R = $\{(1, 2), (2, 3), (3, 4), (4, 5), (5, 6), (6, 7)\}$ is a function or not. Justify your answer. (U)

17. State whether the relation R = $\{(1, 3), (1, 5), (2, 5)\}$ is a function or not. Justify your answer. (U)

18. Find the domain and range of the function $f(x) = -|x|$ (U)

19. Find the domain and range of the function $f(x) = \sqrt{9 - x^2}$ (U)

20. Let $\mathbb{R}$ be the set of real numbers. Define the real function $f: \mathbb{R} \to \mathbb{R}$ by $f(x) = x + 10$. Sketch the graph of this function. (S)

21. Draw the graph of the function $f: \mathbb{R} \to \mathbb{R}$ defiend by $f(x) = x + 5$, where $\mathbb{R}$ is the set of real numbers.(S)

22. The relation f is defined by $f(x) = \begin{cases} x^2, & 0 \le x \le 3 \\ 3x, & 3 \le x \le 10 \end{cases}$

The relation g is defined by $g(x) = \begin{cases} x^2, & 0 \le x \le 2 \\ 3x, & 2 \le x \le 10 \end{cases}$

Show that f is a function and g is not a function. (U)

23. If $f(x) = x^2$, find $\frac{f(1.1) - f(1)}{1.1 - 1}$ (U)

24. Find the domain and range of the function f defined by $f(x) = \sqrt{x - 1}$ (U)

25. Find the domain and range of the function f defined by $f(x) = |x - 1|$ (U)

26. Let $f = \{(1,1), (2, 3), (0, -1), (-1, -3)\}$ be a function from $\mathbb{Z}$ to $\mathbb{Z}$ defined by $f(x) = ax + b$, for some integers a, b. Determine a, b. (U)

27. Let A = $\{1, 2, 3, 4\}$, B = $\{1, 5, 9, 11, 15, 16\}$and $f = \{(1,5), (2,9), (3,1), (4,5), (2,11)\}$. Are the following are true?

(i) $f$is a relation from A to B (ii) f is a function from A to B.

Justify your answer in each case. (U)

28. Let A = $\{9, 10, 11, 12, 13\}$ and let $f: A \rightarrow \mathbb{N}$ be defined by $f(n) =$ the highest prime factor of n.

Find the range of f. (U)

29. Let A and B be two sets such that n(A) = 3 and n(B) = 2. If (x, 1), (y, 2), (z, 1) are in $A \times B$, find A and B, where x, y and z are distinct elements. (S)

30. Let $f = \left\{\left(x, \frac{x^2}{1+x^2}\right) : x \in \mathbb{R}\right\}$ $be\ a\ function\ from\ \mathbb{R}\ into\ \mathbb{R}$. Determine the range of f. (U)

31. Let f be the subset of $\mathbb{Z} \times \mathbb{Z}$ defined by $f = \{(ab, a+b) : a, b \in \mathbb{Z}\}$. Is f a function from $\mathbb{Z}$to $\mathbb{Z}$? Justify your answer. (U)

THREE MARKS QUESTIONS:

1. If P = $\{a, b, c\}$ and Q = $\{r\}$, form the sets $P \times Q$ and $Q \times P$. Are these two products equal? (U)

2. If A = $\{1, 2\}$, B = $\{1, 2, 3, 4\}$ and C = $\{5, 6\}$. Verify that $A \times (B \cap C) = (A \times B) \cap (A \times C)$. (U)

3. If A = $\{1, 2\}$, B = $\{1, 2, 3, 4\}$, C = $\{5, 6\}$ and D = $\{5, 6, 7, 8\}$. Verify that $A \times C$ is a subset of $B \times D$. (U)

4. Let A = $\{1, 2\}$ and B = $\{3, 4\}$. Write $A \times B$. How many subsets will $A \times B$ have? List them. (U)

5. The Cartesian product $A \times A$ has 9 elements among which are found (-1, 0) and (0, 1). Find the set A and the remaining elements of $A \times A$. (S)

6. Let A = $\{1, 2, \cdots, 14\}$. Define a relation R from A to A by R = $\{(x, y) : 3x - y = 0,\ where\ x, y \in A\}$.

Write down its domain, codomain and range. (U)

7. Define a relation R on the set $\mathbb{N}$ of natural numbers by

R = $\{(x, y) : y = x + 5, x\ is\ a\ natural\ number\ less\ than\ 4, x, y \in \mathbb{N}\}$. Depict this relationship using roster form. Write down the domain and range. (U)

8. Let A = $\{1, 2, 3, 4, 6\}$. Let R be the relation on A defined by R = $\{(a, b) : a, b \in A, b\ is\ exactly\ divisible\ by\ a\}$.

Write R in roster form. Find the domain and range of R. (U)

9. Determine the domain and range of the relation R defined by R = $\{(x, x+5) : x \in \{0, 1, 2, 3, 4, 5\}\}$.(U)

10. Let R be the relation on $\mathbb{Z}$ defined by R = $\{(a, b) : a, b \in \mathbb{Z}, a - b\ is\ an\ integer\}$.Find the domain and range of R. (U)

11. Let $\mathbb{N}$ be the set of natural numbers and the relation R be defined on $\mathbb{N}$ such that R $=\{(x, y): y = 2x, x, y \in \mathbb{N}\}$. What is the domain and range of R? Is this relation a function? (U)

12. Let $f(x) = x^2$ and $g(x) = 2x + 1$ be two real functions. Find $(f + g)(x)$, $(f - g)(x)$, $(fg)(x)$ and $\left(\frac{f}{g}\right)(x)$. (U)

13. Let $f(x) = \sqrt{x}$ and $g(x) = x$ be two real functions defined over the set of non-negative real numbers. Find $(f + g)(x)$, $(f - g)(x)$, $(fg)(x)$ and $\left(\frac{f}{g}\right)(x)$. (U)

14. Is the relation R = $\{(2,1), (5,1), (8,1), (11,1), (14,1), (17,1)\}$ a function?Give reason. If it is a function determine its domain and range. (U)

15. Is the relation R = $\{(2,1), (4,2), (6,3), (8,4), (10,5), (12,6), (14,7\}$ a function? Give reason. If it is a function determine its domain and range. (U)

16. A function f is defined by $f(x) = 2x - 5$. Write down the values of (i) $f(0)$, (ii) $f(7)$, (iii) $f(3)$.(U)

17. The function 't' which maps temperature indegree Celsius into temperature in degree Fahrenheit is defined by $t(C) = \frac{9C}{5} + 32$. Find (i) $t(0)$, (ii) $t(28)$, (iii) $t(-10)$. (A)

18. Let R be a relation from $\mathbb{Q}$ to $\mathbb{Q}$ defined by R = $\{(a, b): a, b \in \mathbb{Q}\ and\ a - b \in \mathbb{Z}\}$. Show that

(i) $(a, a) \in$ R for all $a \in \mathbb{Q}$

(ii) $(a, b) \in$ R implies that $(b, a) \in$ R

(iii) $(a, b) \in$ R and $(b, c) \in$ R implies that $(a, c) \in$ R (U)

19. Let $f = \{(1,1), (2,3), (0,-1), (-1,-3)\}$ be a linear function from $\mathbb{Z}\ into\ \mathbb{Z}$. Find $f(x)$. (A)

20. The function f defined by $f(x) = \begin{cases} 1 - x, & x < 0 \\ 1, & x = 0 \\ x + 1, & x > 0 \end{cases}$

Draw the graph of $f(x)$. (S)

21. Let $f, g: \mathbb{R} \to \mathbb{R}$ be defined, respectively by $f(x) = x + 1$, $g(x) = 2x - 3$. Find $f + g$, $f - g$ and $\frac{f}{g}$.(U)

22. Let R be a relation from $\mathbb{N}$ to $\mathbb{N}$ defined by R = $\{(a, b): a, b \in \mathbb{N}\ and\ a = b^2\}$. Are the following true?

(i) $(a, a) \in R, for\ all\ a \in \mathbb{N}$ (ii) $(a, b) \in R, implies\ (b, a) \in R$

(iii) $(a, b) \in R\ and\ (b, c) \in R\ implies\ (a, c) \in R$. (S)

FIVE MARKS QUESTIONS:

1. Define Identity function. Draw the graph of it. Also write its domain and range. (S)

2. Define Signum function. Draw the graph of it. Also write its domain and range. (S)

3. Define Greatest integer function. Draw the graph of it. Also write its domain and range. (S)

4. Define Constant function. If the function f: $\mathbb{R} \rightarrow \mathbb{R}$ is defined by f(x) = 3 for each x ∈ $\mathbb{R}$, draw the graph of it. Also write its domain and range. (S)

5. Define Rational function. If the real valued functionf: $\mathbb{R} - \{0\} \rightarrow \mathbb{R}$ defined by f(x) = $\frac{1}{x}$, draw the graph of it. Also write its domain and range. (S)

6. Define polynomial function. . If the function f: $\mathbb{R} \rightarrow \mathbb{R}$ is defined by f(x) = x^2, draw the graph of it. Also write its domain and range. (S)

7. Define Modulus function. Draw the graph of it. Also write its domain and range. (S)

8. Draw the graph of the function $f(x) = x^3$. Write its domain and range. (S)

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CHAPTER-3

Trigonometric Functions

One mark questions

1. Define radian measure of an angle. (K)

2. Define degree measure of an angle. (K)

3. Define an angle. (K)

4. Define trigonometric functions. (K)

5. Define principal solution of trigonometric functions. (K)

6. Define general solution of trigonometric functions. (K)

7. Write the general solution of the following functions:

(i) $\sin x = 0$ (U) (ii) $\cos x = 0$ (U) (iii) tanx=0 (U)

(iv) $\sin x = \sin y$ (U) (v) $\cos x = \cos y$ (U) (vi) $\tan x = \tan y$ (U)

(vii) $\sin 2\theta = 0$ (U) (viii) $\cos^2 3\theta = 0$ (U) (ix) $\tan\left(\frac{3\theta}{4}\right) = 0$ (U)

8. Write the domain and range of the following function

(i) $\sin x$ (U) (ii) $\cos x$ (U) (iii) $\tan x$ (U)

(iv) $\text{cesec}\, x$ (U) (v) $\sec x$ (U) (vi) $\cot x$ (U)

9. Convert the following in to degrees.

(i) $\frac{\pi}{3}$ (U) (ii) $\frac{\pi}{4}$ (U) (iii) $\frac{\pi}{6}$ (U)

(iv) $\frac{\pi}{2}$ (U) (v) $\frac{3\pi}{4}$ (U) (vi) $\frac{5\pi}{4}$ (U)

(vii) $\frac{4\pi}{3}$ (U) (viii) $\frac{7\pi}{3}$ (U) (ix) $\frac{2\pi}{3}$ (U)

(x) $\frac{5\pi}{6}$ (U) (xi) $\frac{7\pi}{4}$ (U) (xii) $\frac{5\pi}{3}$ (U)

(xiii) $\frac{11\pi}{3}$ (U)

10. Convert the following in to radians

(i) 45^0 (U) (ii) 60^0 (U) (iii) 30^0 (U)

(iv) 90^0 (U) (v) 135^0 (U) (vi) 120^0 (U)

(vii) 150^0 (U) (viii) 180^0 (U) (ix) 210^0 (U)

(x) 225^0 (U) (xi) 240^0 (U) (xii) 300^0 (U)

(xiii) 330^0 (U)

11. Find the value of $\operatorname{cosec}1305^0$ (U)

12. If $x\cos^2\left(\frac{\pi}{6}\right)=2$, find x. (U)

13. If $\sin\theta=\frac{5}{13}$ and θ is in the second quadrant find $\tan\theta$, $\operatorname{cosec}\theta$, $\sec\theta$ (U)

14. If $x=a\sec^4\theta,\ y=a\tan^4\theta$ prove that $\sqrt{x}-\sqrt{y}=\sqrt{a}$ (A)

15. If $\tan\theta=\frac{5}{13}$ and $\pi<\theta<\frac{3\pi}{2}$, find the values of $\sec\theta$ and $\operatorname{cosec}\theta$ (A)

Two marks questions

1. A wheel makes 360 revolutions in one minute. Through how many radians does it turn in one second. (U)

2. Find the degree measure of the angle subtended at the centre of a circle of radius 100 cm by an arc of length 22cm.(use $\pi=\frac{22}{7}$). (U)

3. If in two circles, the arcs of the same length subtendangles 60^0 and 75^0 at the centre, find the ratio of their radii. (U)

4. A minute hand of watch is 1.5cm long. How for does its tip moves in 40 minutes. (A)

5. Find the angle in radian through which a pendulum swings if its length 75cm and the tip describe an arc of length. (U)

6. Convert $40^0 20^1$ into radian. (A)

7. Convert 6radians into degree. (U)

8. Find the value of $(i)\sin\left(\frac{31\pi}{3}\right)$(U) $(ii)\tan\left(\frac{19\pi}{3}\right)$(U) $(iii)\cot\left(-\frac{15\pi}{4}\right)$ (U)

9. Find the values of the following:

$(i)\sin765^0$ (A) $(ii)\operatorname{cosec}\left(-1410^0\right)$ (A)

$(iii)\sin75^0$ (U) $(iv)\cos105^0$ (U) $(v)\tan15^0$ (U)

10. Find the principle value of the following:

$(i)\tan x = \frac{1}{\sqrt{3}}$ (K) $(ii)\sin x = -\frac{\sqrt{3}}{2}$ (K) $(iii)\sec x = 2$ (K)

$(iv)\ \sin x = \frac{\sqrt{3}}{2}$ (K) $(v)\ \cos x = -\frac{1}{2}$ (K) $(vi)\operatorname{cosec} x = -2$ (K)

$(vii)\cos x = \frac{1}{2}$ (K) $(viii)\tan x = -\sqrt{3}$ (K) $(ix)\cot x = -\sqrt{3}$ (K).

11. Prove that $\cos^4\theta - \sin^4\theta = \cos 2\theta$. (A)

12. Prove that $\sqrt{2+\sqrt{2+2\cos\theta}} = 2\cos\theta$. (S)

13. Prove the following:

i)$\sin 2x = 2\sin x\cos x$ (U) ii) $\tan 2x = \frac{2\tan x}{1-\tan^2 x}$ (U)

ii) $\cos 2x = \cos^2 x - \sin^2 x = 1 - 2\sin^2 x = 2\cos^2 x - 1$ (U)

iii) $\sin 3x = 3\sin x - 4\sin^3 x$ (U) iv) $\cos 3x = 4\cos^3 x - 3\cos x$ (U)

v) $\tan 3x = \frac{3\tan x - \tan^3 x}{1-3\tan^2 x}$ (U)vi)$\sin 2x = \frac{2\tan x}{1+\tan^2 x}$ (U)

vii) $\cos 2x = \frac{1-\tan^2 x}{1+\tan^2 x}$ (U)

viii) $\cot(x+y) = \frac{\cot x\cot y - 1}{\cot x + \cot y}$ (U)ix) $\cot(x+y) = \frac{\cot x\cot y + 1}{\cot y - \cot x}$ (U)

Three marks questions.

1. Prove that for any real numbers x and y $\sin x = \sin y \Rightarrow x = n\pi + (-1)^n y,\ \forall n \in Z$ (U)

2. Prove that for any real numbers x and y $\cos x = \cos y \Rightarrow x = 2n\pi \pm y,\ \forall n \in Z$ (U)

3. If x and y are not odd multiple of $\frac{\pi}{2}$, then $\tan x = \tan y \Rightarrow x = n\pi + y,\ \forall n \in Z$ (U)

4. Find the general solution of the following:

$(i)\cos 4x = \cos 2x$ (U) $(ii)2\cos^2 x + 3\sin x = 0$ (U)

$(iii)\sin 2x + \cos x = 0$ (U) $(iv)\sec^2 2x = 1 - \tan 2x$ (U)

5. Prove the following:

$(i)\cos 4x = 1 - 8\sin^2 x\cos^2 x$ (A)

(ii) $2\cos\frac{\pi}{13}\cos\frac{9\pi}{13}+\cos\frac{3\pi}{13}+\cos\frac{5\pi}{13}=0$ (A)

(iii) $\tan 3x\tan 2x\tan x=\tan 3x-\tan 2x-\tan x$ (S)

(iv) $\cos\left(\frac{\pi}{4}+x\right)+\cos\left(\frac{\pi}{4}-x\right)=\sqrt{2}\cos x$ (U)

(v) $\cos\left(\frac{3\pi}{4}+x\right)-\cos\left(\frac{3\pi}{4}-x\right)=-\sqrt{2}\sin x$ (A)

6. Prove the following:

(i) $\frac{\sin x+\sin 3x}{\cos x+\cos 3x}=\tan 2x$ (U)

(ii) $\frac{\sin x-\sin y}{\cos x+\cos y}=\tan\left(\frac{x-y}{2}\right)$ (U)

(iii) $\frac{\sin 5x+\sin 3x}{\cos 5x+\cos 3x}=\tan 4x$ (U)

(iv) $\frac{\cos 7x+\cos 5x}{\sin 7x-\sin 5x}=\cot x$ (U)

(v) $\frac{\cos 9x-\cos 5x}{\sin 17x-\sin 3x}=-\frac{\sin 2x}{\cos 10x}$ (U)

7. If $A+B=\frac{\pi}{4}$, prove that (i) $(1+\tan A)(1+\tan B)=2$ (A) (ii) $(\cot A-1)(\cot B-1)=2$ (A)

8. Prove that $\cos^6\theta+\sin^6\theta=1-\frac{3}{4}\sin^2 2\theta$ (A)

9. Prove the following:

(i) $\frac{\sin A+\sin 2A+\sin 3A}{\cos A+\cos 2A+\cos 3A}=\tan 2A$. (A)

(ii) $\sin(A+B)\sin(A-B)=\sin^2 A-\sin^2 B$. (A)

(iii) $\cos(A+B)\cos(A-B)=\cos^2 A-\sin^2 B$. (A)

10. If θ is acute , then prove that $\sin\theta+\cos\theta>1$. (A)

Five marks questions

1. Prove the following:

(i) $\sin x+\sin 3x+\sin 5x+\sin 7x=4\cos x\cos 2x\sin 4x$ (A)

(ii) $\sin 3x+\sin 2x-\sin x=4\sin x\cos\frac{x}{2}\cos\frac{3x}{2}$ (A)

(iii) $\dfrac{\sin 5x - 2\sin 3x + \sin x}{\cos 5x - \cos x} = \tan x$ (A)

(iv) $\dfrac{\sin 9x + \sin 7x + \sin 5x + \sin 3x}{\cos 9x + \cos 7x + \cos 5x + \cos 3x} = \tan 6x$ (A)

2. Solve the following:

(i) $\cos 3x + \cos x - \cos 2x = 0$ (A)

(ii) $\sin x + \sin 3x + \sin 5x = 0$ (A)

(iii) $(\sin 3x + \sin x)\sin x + (\cos 3x - \cos x)\cos x = 0$ (A)

3. Prove the following:

(i) $\sin 20^0 \sin 40^0 \sin 60^0 \sin 80^0 = \dfrac{3}{16}$ (A)

(ii) $\cos 20^0 \cos 40^0 \cos 60^0 \cos 80^0 = \dfrac{1}{16}$ (A)

(iii) $\tan 20^0 \tan 40^0 \tan 60^0 \tan 80^0 = 3$ (A)

(iv) $\sin 10^0 \sin 30^0 \sin 50^0 \sin 70^0 = \dfrac{1}{16}$ (S)

4. Prove that $\dfrac{\sec 8\theta - 1}{\sec 4\theta - 1} = \dfrac{\tan 8\theta}{\tan 4\theta}$. (A)

5. Prove that $\dfrac{\cos 8A \cos 5A - \cos 12A \cos 9A}{\sin 8A \cos 5A + \cos 12A \sin 9A} = \tan 4A$. (A)

6. Prove the following:

(i) $(\cos\alpha + \cos\beta)^2 + (\sin\alpha - \sin\beta)^2 = 4\cos^2\left(\dfrac{\alpha+\beta}{2}\right)$ (S)

(ii) $(\cos\alpha - \cos\beta)^2 + (\sin\alpha - \sin\beta)^2 = 4\sin^2\left(\dfrac{\alpha-\beta}{2}\right)$ (S)

7. Prove the following:

(i) $\sin A + \sin B + \sin C = 4\cos\left(\dfrac{A}{2}\right)\cos\left(\dfrac{B}{2}\right)\cos\left(\dfrac{C}{2}\right)$ (S)

(ii) $\cos A + \cos B + \cos C = 1 + 4\sin\left(\dfrac{A}{2}\right)\sin\left(\dfrac{B}{2}\right)\sin\left(\dfrac{C}{2}\right)$ (S)

$(iii)\ \sin^2 A+\sin^2 B+\sin^2 C=2+2\cos A\cos B\cos C$ (S)

$(iv)\ \cos^2 A+\cos^2 B+\cos^2 C=1-2\cos A\cos B\cos C$ (S)

8. Find $\sin\frac{x}{2}, \cos\frac{x}{2}$ and $\tan\frac{x}{2}$ for the following

$(i)\ \tan x=-\frac{4}{3}$, Where x is in second quadrant (S)

$(ii)\ \cos x=-\frac{1}{3}$, Where x is in fourth quadrant, (S)

$(iii)\ \sin x=\frac{1}{4}$, Where x is in second quadrant, (S)

$(iv)\ \tan x=\frac{3}{4},\ \pi<x<\frac{3\pi}{2}$ (S)

9. Prove geometrically that: $\cos(x+y)=\cos x\cos y-\sin x\sin y$ and hence find $\cos 75°$ (A)

10. $\tan 4x=\frac{4\tan x-4\tan^3 x}{1-6\tan^2 x+\tan^4 x}$ (A)

11. $\cos 6x=32\cos^6 x-48\cos^4 x+18\cos^2 x-1$ (A)

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CHAPTER-4
PRINCIPLE OF MATHEMATICAL INDUCTION

5 Marks Questions

Type No-1

Q. Prove the following by using the principle of mathematical induction for all $n \in N$

1) $1+2+3+..........+n=\dfrac{n(n+1)}{2}$ (U)

2) $1^2+2^2+3^2+..........+n^2=\dfrac{n(n+1)(2n+1)}{6}$ (U)

3) $1^3+2^3+3^3+..........+n^3=\dfrac{n^2(n+1)^2}{4}$ (U)

4) $1^2+3^2+5^2+..........+(2n-1)^2=\dfrac{n(2n-1)(2n+1)}{3}$ (A)

5) $1+3+3^2+..........+3^{n-1}=\dfrac{3^n-1}{2}$ (A)

6) $1.2.3+2.3.4+..........+n(n+1)(n+2)=\dfrac{n(n+1)(n+2)(n+3)}{4}$ (U)

7) $1.2+2.3+3.4+..........+n.(n+1)=\dfrac{n(n+1)(n+2)}{3}$ (U)

8) $1.3+3.5+5.7+..........+(2n-1)(2n+1)=\dfrac{n(4n^2+6n-1)}{3}$ (S)

9) $1.3+2.3^2+3.3^3+.......+n.3^n=\dfrac{(2n-1)3^{n+1}+3}{4}$ (S)

10) $1.2+2.2^2+3.2^3+..........+n.2^n=(n-1)2^{n+1}+2$ (A)

11) $a+ar+ar^2+......+ar^{n-1}=\dfrac{a(r^n-1)}{r-1}.(r\neq 1)$ (A)

12) $1^2+2^2+3^2+..........+n^2>\dfrac{n^3}{3}$ (A)

Type No-2

Q. Prove the following by using the principle of mathematical induction for all $n \in N$

1) $\dfrac{1}{1.2}+\dfrac{1}{2.3}+\dfrac{1}{3.4}+..........+\dfrac{1}{n(n+1)}=\dfrac{n}{n+1}$ (S)

2) $\dfrac{1}{2.5}+\dfrac{1}{5.8}+\dfrac{1}{8.11}+..........+\dfrac{1}{(3n-1)(3n+2)}=\dfrac{n}{6n+4}$ (S)

3) $\dfrac{1}{1.2.3}+\dfrac{1}{2.3.4}+\dfrac{1}{3.4.5}+..........+\dfrac{1}{n(n+1)(n+2)}=\dfrac{n(n+3)}{4(n+1)(n+2)}$ (S)

4) $\dfrac{1}{2}+\dfrac{1}{4}+\dfrac{1}{8}+..........+\dfrac{1}{2^n}=1-\dfrac{1}{2^n}$ (S)

5) $1+\frac{1}{1+2}+\frac{1}{1+2+3}+..........+\frac{1}{1+2+3+....+n}=\frac{2n}{n+1}$ (S)

6) $\frac{1}{1.4}+\frac{1}{4.7}+\frac{1}{7.10}+..........+\frac{1}{(3n-2)(3n+1)}=\frac{n}{3n+1}$ (S)

7) $\frac{1}{3.5}+\frac{1}{5.7}+\frac{1}{7.9}+..........+\frac{1}{(2n+1)(2n+3)}=\frac{n}{3(2n+3)}$ (S)

Type No-3

Q. Prove the following by using the principle of mathematical induction for all $n \in N$

1) $7^n - 3^n$ *is divisible by* 4. (A)

2) $2.7^n + 3.5^n - 5$ *is divisible by* 24. (A)

3) $n(n+1)(n+5)$ *is a multiple of* 3. (A)

5) $x^{2n} - y^{2n}$ *is divisible by* $x+y$. (S)

6) $3^{2n+2} - 8n - 9$ *is divisible by* 8. (S)

7) $41^n - 14^n$ *is multiple of* 27. (A)

8) Pr*ove the rule of* exp*onents* $(ab)^n = (a)^n (b)^n$. (A)

9) $(2n+7) < (n+3)^2$. (A)

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CHAPTER-5

Complex numbers and Quadratic Equations

1 Mark Questions

1. Define a complex number. (K)
2. Define Equality of two complex numbers. (K)
3. Define purely real and purely imaginary numbers. (K)
4. Define addition of two complex numbers. (K)
5. Define difference of two complex numbers. (K)
6. Define multiplication of two complex numbers. (K)
7. Define division of two complex numbers. (K)
8. Define modulus of a complex number. (K)
9. Define conjugate of a complex number. (K)
10. What is Polar form of a complex numbers? (K)

Q. Express the following in the form of a + ib

1) $(-5i)\left(\frac{1}{8}i\right)$ (U) 2) $(-i)(2i)\left(\frac{-1}{8}i\right)^3$ (U)

3) $(5i)\left(\frac{-3}{5}i\right)$ (U) 4) $i^9 + i^{19}$ (U)

5) i^{-39} (U) 6) $3(7+i7)+i(7+i7)$ (U)

7) $(1-i)-(-1+i6)$ (K) 8) i^{-35} (K)

2 Marks Questions

Q. Express the following in the form of a + ib

1) $\frac{5+\sqrt{2}i}{1-\sqrt{2}i}$ (U) 2) $(5-3i)^3$ (U) 3) $(1-i)^4$ (U)

4) $\left(\frac{1}{3}+3i\right)^3$ (U) 5) $\left(-2-\frac{1}{3}i\right)^3$ (U) 6) $\left[i^{18}+\left(\frac{1}{i}\right)^{25}\right]^3$ (A)

7) $\frac{(3+i\sqrt{5})(3-i\sqrt{5})}{(\sqrt{3}+\sqrt{2}i)-(\sqrt{3}-i\sqrt{2})}$ (A) 8) $(-\sqrt{3}+\sqrt{-2})(2\sqrt{3}-i)$ (U)

Q. Find the multiplicative inverse of each of the following complex numbers

1). $2-3i$ (U)

2). $4-3i$ (U)

3). $\sqrt{5}+3i$ (U)

4). $-i$ (U)

5). $\frac{1+i}{1-i}$ (A)

6). $\frac{2+3i}{3+4i}$ (A)

3 Marks Questions

Q. Find the modulus and argument (amplitude) of each of the following complex numbers and express in polar form

1). $1+i\sqrt{3}$ (U) 2). $-1-i\sqrt{3}$ (U)

3). $-\sqrt{3}+i$ (U) 4). $\sqrt{3}+i$ (U)

5). $1-i$ (U) 6). $-1+i$ (U)

7). $-1-i$ (U) 8). -3 (U)

9). i (U) 10). $\frac{1+i}{1-i}$ (U)

11). $\frac{1}{1+i}$ (U) 12). $\frac{i-1}{\cos\frac{\pi}{3}+i\sin\frac{\pi}{3}}$ (U)

13). $\frac{1+7i}{(2-i)^2}$ (U) 14). $\frac{1+3i}{1-2i}$ (U)

15). $\frac{1+2i}{1-3i}$ (U) 16). $\frac{-16}{1+i\sqrt{3}}$ (U)

3 Marks Questions

1). If 4x + i(3x – y) = 3 + i(-6), where x and y are real numbers, then find the values of x and y (U)

2). Find the real numbers x and y if (x – iy)(3 + 5i) is the conjugate of -6 – 24i. (U)

3). $If\ \left(\frac{1+i}{1-i}\right)^m=1$, then find the least positive integral value of m (S)

4). $If\ \ x-iy=\sqrt{\frac{a-ib}{c-id}},\ \ prove\ \ that\ \left(x^2+y^2\right)^2=\frac{a^2+b^2}{c^2+d^2}$ (U)

5). If $x+iy=\frac{a+ib}{a-ib},\ \ prove\ \ that\ \ x^2+y^2=1$ (U)

6) If $a+ib=\frac{(x+i)^2}{2x^2+1},\ \ prove\ \ that\ \ a^2+b^2=\frac{(x^2+1)^2}{(2x^2+1)^2}$ (S)

7) If $(x + iy)^3 = u + iv$ then show that $u/x + v/y = 4(x^2 - y^2)$ (S)

8). Find real θ such that $\frac{3+2i\sin\theta}{1-2i\sin\theta}$, is purely real (S)

9) Find the conjugate of $\frac{(3-2i)(2+3i)}{(1+2i)(2-i)}$, (S)

10) If $Z_1 = 2 - i$, $Z_2 = 1 + i$ then find $\left|\frac{Z_1+Z_2+1}{Z_1-Z_2+1}\right|$ (S)

11) $Z_1 = 2 - i$, $Z_2 = -2 + i$ find $i)\ \text{Re}\left(\frac{Z_1 Z_2}{\overline{Z_1}}\right)$ $ii)\ \text{Im}\left(\frac{1}{Z_1 \overline{Z_1}}\right)$ (S)

12) if (a + i b) (c + i d) (e + i f) (g + i h) = A + i B then

Show that $(a^2 + b^2)(c^2 + d^2)(e^2 + f^2)(g^2 + h^2) = A^2 + B^2$ (U)

Quadratic Equations

2 Marks Questions

Q. Solve the following Equations

1). $x^2 + 2 = 0$ (U)

2). $x^2 + x + 1 = 0$ (U)

3). $\sqrt{5}x^2 + x + \sqrt{5} = 0$ (U)

4). $x^2 + 3 = 0$ (U)

5). $2x^2 + x + 1 = 0$ (U)

6). $x^2 + 3x + 9 = 0$ (U)

7). $-x^2 + x - 2 = 0$ (U)

8). $x^2 + 3x + 5 = 0$ (U)

9). $x^2 - x + 2 = 0$ (U)

10). $\sqrt{2}x^2 + x + \sqrt{2} = 0$ (U)

11). $\sqrt{3}x^2 - \sqrt{2}x + 3\sqrt{3} = 0$ (U)

12). $x^2 + x + \frac{1}{\sqrt{2}} = 0$ (U)

13). $x^2 + \frac{x}{\sqrt{2}} + 1 = 0$ (U)

14). $3x^2 - 4x + \frac{20}{3} = 0$ (U)

15). $x^2 - 2x + \frac{3}{2} = 0$ (U)

16). $27x^2 - 10x + 1 = 0$ (U)

17). $21x^2 - 28x + 10 = 0(U)$

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CHAPTER-6

LINEAR INEQUALITIES

Two marks Questions:

I 1) Solve $30x < 200$ when

i) $x$is a natural number, ii) x is an integer. (k)

2) Solve $24x < 100$, when

i) $x$is a natural number. ii) $x$is an integer. (k)

3) Solve$-12x > 30$, when

i) $x$is a natural number. ii) $x$is an integer. (k)

4) Solve $5x - 3 < 3x + 1$ when

i) $x$is an integer, ii) x is a real number. (k)

5) Solve $5x - 3 < 7$, when

i) $x$is an integer. ii) $x$is a real number. (k)

6) Solve $3x + 8 > 2$, when

i) $x$is an integer. ii) $x$is a real number. (k)

II. Solve following inequalities for real number x

1) $4x + 3 < 6x + 7$ (k)

2) $4x + 3 < 5x + 7$ (k)

3) $3x - 7 > 5x - 1$ (k)

4) $3(x - 1) \leq 2(x - 3)$ (k)

5) $3(2 - x) \geq 2(1 - x)$ (k)

6) $\frac{5-2x}{3} \leq \frac{x}{6} - 5$ (U)

7) $x + \frac{x}{2} + \frac{x}{3} < 11$ (U)

8) $\frac{x}{3} > \frac{x}{2} + 1$ (U)

9) $\frac{3(x-2)}{5} \leq \frac{5(2-x)}{3}$ (U)

10) $\frac{1}{2}\left[\frac{3x}{5} + 4\right] \geq \frac{1}{3}(x - 6)$ (U)

11) $2(2x + 3) - 10 < 6(x - 2)$ (U)

12) $37-(3x+5)\geq 9x-8(x-3)$ (U)

13) $\frac{x}{4}<\frac{(5x-2)}{3}-\frac{(7x-3)}{5}$ (U)

14) $\frac{(2x-1)}{3}\geq\frac{(3x-2)}{4}-\frac{(2-x)}{5}$ (U)

15) $-8\leq 5x=3<7$ (A)

16) $-5\leq\frac{5-3x}{2}\leq 8$ (A)

17) $2\leq 3x-4\leq 5$ (A)

18) $6\leq 3(2x-4)<12$ (A)

19) $-3\leq 4-\frac{7x}{2}\leq 18$ (A)

20) $-15<\frac{3(x-2)}{5}\leq 0$ (A)

21) $-12<4-\frac{3x}{-5}\leq 2$ (A)

22) $7\leq\frac{(3x+11)}{2}\leq 11$ (A)

III) Solve the following inequalities and show the graph of the solution in each case on number line

1) $7x+3<5x+9$ (k)

2) $\frac{3x-4}{2}\geq\frac{x+1}{4}-1$ (U)

3) $3x-2<2x+1$ (k)

4) $5x-3\geq 3x-5$ (k)

5) $3(1-x)<2(x+4)$ (k)

6) $\frac{x}{2}\geq\frac{(5x-2)}{3}-\frac{(7x-3)}{5}$ (U)

IV. 1) 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. (A)

2) Find all pairs of consecutive odd natural numbers, both of which are larger than 10, such that their sum is less than 40. (A)

3) Ravi obtained 70 and 75 marks in first two unit test. Find the minimum marks he should get in the third test to have an average of at least 60 marks. (A)

4) To receive Grade 'A' in a course, one must obtain an average of 90 marks of more in five examinations (each of 100 marks). If Sunita's marks in first four examinations are 87,92,94 and 95, find minimum marks that Sunita must obtain in fifth examination to get grade 'A' in the course. (A)

5) Find all pairs of consecutive odd positive integers both of which are smaller than 10 such that their sum is more than 11. (A)

6) Find all pairs of consecutive even positive integers, both of which are larger than 5 such that their sum is less than 23. (A)

V. Solve the following system of inequalities and represent the solution graphically on the number line.

1) $3x - 7 < 5 + x, \ \ 11 - 5x \leq 1$ (A)

2) $5x + 1 > -24, \ \ 5x - 1 < 24$ (A)

3) $2(x-1) < x + 5, \ \ 3(x+2) > 2 - x$ (A)

4) $3x - 7 > 2(x-6), \ \ 6 - x > 11 - 2x$ (A)

5) $5(2x-7) - 3\,(2x+3) \leq 0, \ \ 2x + 19 \leq 6x + 47$ (A)

VI. Solve the following Inequalities graphically in two-dimensional plane.

1) $3x + 2y > 6$ (k)

2) $3x - 6 \geq 0$ (k)

3) $y < 2$ (k)

4) $x + y < 5$ (k)

5) $2x + y \geq 6$ (k)

6) $3x + 4y \leq 12$ (k)

7) $y + 8 \geq 2x$ (k)

8)$x - y \leq 2$ (k)

9) $2x - 3y > 6$ (k)

10) $-3x + 2y \geq -6$ (k)

11) $3y - 5x < 30$ (k)

12)$y < -2$ (k)

13) $x > -3$ (k)

Five marks Questions:

I. Solve the following system of linear inequalities graphically.

1) $x + y \geq 5\,, \ \ x - y \leq 3$ (U)

2) $5x + 4y \leq 40\ ,x \geq 2\,, \ \ y \geq 3$ (U)

3) $x+2y \leq 8$, $2x+y \leq 8$, $x \geq 0$, $y \geq 0$ (U)

4) $x \geq 3$, $y \geq 2$ (U)

5) $3x+2y \leq 12$, $x \geq 1$, $y \geq 2$ (A)

6) $2x+y \geq 6$, $3x+4y \leq 12$ (A)

7) $x+y \geq 4$, $2x-y>0$ (A)

8) $2x-y>1$, $x-2y<-1$ (A)

9) $x+y \leq 6$, $x+y \geq 4$ (A)

10) $2x+y \geq 8$, $x+2y \geq 10$ (A)

11) $x+y \leq 9$, $y>x$, $x \geq 0$ (A)

12) $5x+4y \leq 20$, $x \geq 1$, $y \geq 2$ (A)

13) $3x+4y \leq 60$, $x+3y \leq 30$, $x \geq 0$, $y \geq 0$ (A)

14) $2x+y \geq 4$, $x+y \leq 3$, $2x-3y \leq 6$ (A)

15) $x-2y \leq 3$, $3x+4y \geq 12$, $x \geq 0$, $y \geq 1$ (A)

16) $4x+3y \leq 60$, $y \geq 2x$, $x \geq 3$, $x, y \geq 0$ (A)

17) $3x+2y \leq 150$, $x+4y \leq 80$, $x \leq 15$, $y \geq 0$, $x \geq 0$ (A)

18) $x+2y \leq 10$, $x+y \geq 1$, $x-y \leq 0$, $x \geq 0$, $y \geq 0$(A)

II. Statement Problems:

1) In an experiment, a solution of hydrochloric acid is to be kept between 30^0 and 35^0 Celsius. What is the range of temperature in degree Fahrenhiet if conversion formula is given by C=$\frac{5}{9}(F-32)$, where C and F represent temperature in degree Celsius and degree Fahrenhiet , respectively. (S)

2) A manufacturer has 600 litres of a 12% solution of acid. How many litres of a 30% acid solution must be added to it so that acid content in the resulting mixture will be more than 15% but less than 18%? (S)

3) A solution is to be kept between 68^0 F and 77^0 F. What is the range in temperature in degree Celsius (C) if the Celsius/ Fahrenheit (F) conversion formula is given by $F=\frac{9}{5}C+32$? (S)

4) A solution of 8% boric acid is to be diluted by adding a 2% boric acid solution to it. The resulting mixture is to be more than 4% but less than 6% boric acid. If we have 640 litres of the 8% solution, how many litres of the 2% solution will have to be added? (S)

5) How many litres of water will have to be added to 1125 litres of the 45% solution of acid so that the resulting mixture will contain more than 25% but less than 30% acid content? (S)

5) IQ of a person is given by the formula $IQ = \frac{MA}{CA} \times 100$, where MA is mental age and CA is chronological age. If $80 \leq IQ \leq 140$ for a group of 12 years old children, find the range of their mental age. (S)

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CHAPTER-7
PERMUTATIONS AND COMBINATIONS

One mark questions

1. Find the number of 4 letter words, with or without meaning, which can be formed out of the letters of the word ROSE, where the repetition of the letters is not allowed. (U)
2. Given 4 flags of different colours, how many different signals can be generated, if a signal requires the use of 2 flags one below the other? (U)
3. How many 3-digit numbers can be formed from the digits 1, 2, 3, 4 and 5 assuming that repetition of the digits is allowed? (U)
4. How many 3-digit numbers can be formed from the digits 1, 2, 3, 4 and 5 assuming that repetition of the digits is not allowed? (U)
5. How many 4-letter codes can be formed using the first 10 letters of the English alphabet, if no letter can be repeated? (U)
6. How many 5-digit telephone numbers can be formed using the digits 0 to 9 if each number starts with 67 and no digit appears more than once? (U)
7. A coin is tossed 3 times and the outcomes are recorded. How many possible outcomes are there? (U)
8. Evaluate 5! (K)
9. Evaluate 7! – 5! (K)
10. Compute $\frac{7!}{5!}$ (K)
11. Compute $\frac{12!}{(10!)\ (2!)}$ (K)
12. Evaluate $\frac{n!}{r!\ (n-r)!}$, when n = 5, r = 2. (K)
13. Evaluate 8! (K)
14. Evaluate 4! – 3! (K
15. Is 3! + 4! = 7! ? (K)
16. Compute $\frac{8!}{(6!)\ (2!)}$. (K)
17. Evaluate $\frac{n!}{(n-r)!}$, when n = 6, r = 2 (K)
18. Evaluate $\frac{n!}{(n-r)!}$, when n =9, r =5. (K)
19. Find the number of permutations of the letters of the word ALLAHABAD. (U)
20. How many 4-digit numbers can be formed by using the digits 1 to 9 if repetition of digits is not allowed? (U)
21. In how many ways can 4 red, 3 yellow and 2 green discs be arranged in a row if the discs of the same colour are indistinguishable? (A)
22. How many 4-digit numbers are there with no digit repeated? (S)
23. How many 3-digit even numbers can be made using the digits 1, 2, 3, 4, 6, 7, if no digit is repeated? (U)
24. From a committee of 8 persons, in how many ways can we choose a chairman and a vice chairman assuming one person cannot hold more than one position? (U)
25. How many words, with or without meaning, can be formed using all the letters of the word EQUATION, using each letter exactly once? (U)

26.If ${}^{n}C_9 = {}^{n}C_8, find\, {}^{n}C_{17}$ (K)

27. A committee of 3 persons is to be constituted from a group of 2 men and 3 women. In how many ways can this be done? (U)

28. If ${}^{n}C_8 = {}^{n}C_2, find\, {}^{n}C_2.$ (K)

29. How many chords can be drawn through 21 points on a circle? (A)

30.In how many ways can a team of 3 boys and 3 girls be selected from 5 boys and 4 girls? (A)

31. In how many ways can one select a cricket team of eleven from 17 players in which only 5 players can bowl if each cricket team of 11 must include exactly 4 bowlers? (A)

32. A bag contains 5 black and 6 red balls. Determine the number of ways in which 2 black and 3 red balls can be selected. (A)

33. In how many ways can a student choose a programme of 5 courses if 9 courses are available and 2 specific courses are compulsory for every student? (S)

Three marks questions

34. Find the number of different signals that can be generated by arranging at least 2 flags in order (one below the other) on a vertical staff, if five different flags are available. (A)

35.If $\frac{1}{8!} + \frac{1}{9!} = \frac{x}{10!}$, find x. (K)

36.If $\frac{1}{6!} + \frac{1}{7!} = \frac{x}{8!}$, find x. (K)

37.How many numbers lying between 100 and 1000 can be formed with the digits 0, 1, 2, 3, 4, 5 if the repetition of the digits is not allowed? (U)

38.Find the value of *n* such that ${}^{n}p_5 = 42.\ {}^{n}p_3$, n> 4 (K)

39.Find r, if5. ${}^{4}p_r = 6.\ {}^{5}p_{r-1}.$ (K)

40.Find the value of *n* such that $\frac{{}^{n}p_4}{{}^{n-1}p_4} = \frac{5}{3}$, n> 4. (K)

41.Find the number of different 8-letter arrangements that can be made from the letters of the word DAUGHTER so that

(i)all vowels occur together (ii) all vowels do not occur together. (U)

42.Find the number of arrangements of the letters of the word INDEPENDENCE. In how many of these arrangements,

(i) do the words start with P (ii) do the words begin with I and end in P? (U)

43.Find n, if ${}^{n-1}p_3 : {}^{n}p_4 = 1:9.$ (K)

44.Find r if ${}^{5}p_r = 2.\ {}^{6}p_{r-1}.$ (K)

45.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? (U)

46. In how many distinct permutations of the letters of the word MISSISSIPPI the four I's do not come together? (U)

47. In how many ways can the letters of the word PERMUTATIONS be arranged if the (i) words start with P and end with S, (ii) all the vowels are together. (S)

48. Determine the number of 5 card combinations out of a deck of 52 cards if each selection of 5 cards has exactly one king. (A)

Five marks questions:

49. 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. (A)

50. How many words, with or without meaning, each of 3 vowels and 2 consonants can be formed from the letters of the word INVOLUTE? (A)

51. 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) no girl ? (ii) at least one boy and one girl ? (iii) at least 3 girls ? (A)

52. How many numbers greater than 1000000 can be formed by using the digits 1, 2, 0, 2, 4, 2, 4? (U)

53. A committee of 7 is to be formed from 9 boys and 4 girls. In how many ways can this be done when the committee consists of:
(i) exactly 3 girls? (ii) at least 3 girls ? (iii) at most 3 girls ? (A)

54. In an examination, a question paper consists of 12 questions divided into two parts i.e., Part I and Part II, containing 5 and 7 questions, respectively. A student is required to attempt 8 questions in all, selecting at least 3 from each part. In how many ways can a student select the questions? (A)

55. Prove that ${}^{n}C_r + {}^{n}C_{r-1} = {}^{n+1}C_r$ and hence If ${}^{n}C_9 = {}^{n}C_8$, $find\ {}^{n}C_{17}$. (U)

56. From a class of 25 students, 10 are to be chosen for an excursion party. There are 3 students who decide that either all of them will join or none of them will join. In how many can the excursion party be chosen? (A)

57. 4 cards are chosen from a pack of 52 playing cards In how many of these
i) are face cards ii) two are red cards and two are black cards iii) cards are of the same colour?(A)

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CHAPTER-8

BINOMIAL THEOREM

THREE MARKS QUESTIONS:

1. Using Binomial Theorem evaluate $i)\ (102)^5\ ii)\ (99)^5$. (K)
2. Show that $9^{n+1} - 8n - 9$ is divisible by 64, whenever n is a positive integer. (A)
3. Using Binomial theorem, prove that $6^n - 5n$ always leaves remainder 1 when divided by 25. (S)
4. Find $a if the 17^{th} and 18^{th} terms of the expansion (2+a)^{50} are equal.$ (U)
5. Find the coefficient of $a^5 b^7 in (a-2b)^{12.}$ (U)
6. Find a positive value of m for which the coefficient of x^2 in the expansion $(1+x)^m$ is 6. (U)

7. In the expansion of $(1+a)^{m+n}$, prove that coefficients of $a^m and a^n$ are equal. (A)
8. Prove that the coefficient of x^n in the expansion of $(1+x)^{2n}$ is twice the coefficient of x^n in the expansion of $(1+x)^{2n-1}$. (U)
9. Which is larger $(1.01)^{100000}$ or 10,000? (K)
10. Prove that $\sum_{r=0}^{n} 3^r .\ n_{C_r} = 4^n$. (K)
11. Find the coefficient of $x^5 in (x+3)^8$. (U)
12. Find the 4^{th} term in the expansion of $(x-2y)^{12}$. (U)
13. Find the 13^{th} term in the expansion of $\left(9x - \frac{1}{3\sqrt{x}}\right)^{18}$. (U)
14. Find the middle term in the expansion of $\left(\frac{x}{3} + 9y\right)^{10}$. (U)
15. Show that the middle term in the expansion of $(1+\mathrm{x})^{2\mathrm{n}}$ is $\frac{1.3.5\ldots\ldots(2n-1)}{n!}\ 2n.x^n$. (A)
16. If the coefficients of $(r-5)^{th}$ and $(2r-1)^{th}$ terms of the expansion $(1+x)^{34}$ are equal, find r. (A)
17. Find the r^{th} term from the end in the expansion of $(x+a)^n$. (A)
18. Find the value of $\left(a^2 + \sqrt{a^2-1}\right)^4 + \left(a^2 - \sqrt{a^2-1}\right)^4$. (A)
19. If a and b are distinct integers, prove that a – b is a factor of $a^n - b^n$, when n is a positive integer. (A)
20. Find the coefficient of x^5 in the product $(1+2x)^6(1-x)^7$. (A)
21. Expand each of the following and find the sum of the binomial coefficients in each case:

i) $\left(\frac{2}{x} - \frac{x}{2}\right)^5$ ii) $\left(\frac{x}{3} + \frac{1}{x}\right)^6$ iii) $(2x-3)^7$. (U)

FIVE MARKS QUESTIONS:

1. State and prove Binomial Theorem for any positive integer n. (K)
2. Find $(a+b)^4 - (a-b)^4$. Hence, evaluate $\left(\sqrt{3}+\sqrt{2}\right)^4 - \left(\sqrt{3}-\sqrt{2}\right)^4$. (S)
3. The second, third and fourth terms in the binomial expansion $(x+a)^n$ are 24, 720 and 1080 respectively. Find x , a and n. (A)
4. The coefficients of the $(r-1)^{th}$, r^{th} and $(r+1)^{th}$ terms in the expansion of $(x+1)^n$ are in the ratio $1:3:5$. Find n and r. (A)
5. Find the middle terms in the expansion of i) $\left(3 - \frac{x^3}{6}\right)^7$ ii) $\left(\frac{x}{3} + 9y\right)^{11}$. (U)

6. Find the term independent of x in the expansionof i) $\left(\frac{3}{2}x^2 - \frac{1}{3x}\right)^6$ ii) $\left(\sqrt[3]{x} + \frac{1}{2\sqrt[3]{x}}\right)^{18}, x > 0$. (U)

7. The coefficients of three consecutive terms in the expansion of $(1 + a)^n$ are in the ratio of 1:7:42. Find n. (A)

8. The sum of the coefficients of the first three terms in the expansion of $\left(x - \frac{3}{x^2}\right)^m, m \neq 0$, m being natural number, is 559. Find the term of the expansion containing x^3. (A)

9. Show that the coefficient of the middle term in the expansion of $(x + 1)^{2n}$ is equal to the sum of the coefficients of two middle terms in the expansion of $(x + 1)^{2n-1}$. (A)

10. Find n, if the ratio of fifth term from the beginning to the fifth term from the end in the expansion of $\left(\sqrt[4]{2} + \frac{1}{\sqrt[4]{3}}\right)^n$ is $\sqrt{6}:1$. (S)

11. If the coefficients of a^{r-1}, a^r, and a^{r+1} in the expansion of $(1 + x)^n$ are in arithmetic progression, prove that $n^2 - n(4r+1) + 4r^2 - 2 = 0$. (A)

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CHAPTER-9

SEQUENCES AND SERIES

One mark questions

1. Find the 16^{th} term of the sequence $a_n = 4n-3$ (K)
2. Find the 5^{th} term of the sequence $a_n = \frac{n^2}{2^n}$ (K)
3. Find the 7^{th} term of the sequence $a_n = (-1)^n n^3$ (K)
4. Find the 20^{th} term of the sequence $a_n = \frac{n(n-2)}{n+3}$ (K)
5. If 3,n,8 are the three consecutive terms of the Fibonacci sequence, then find the value of n. (K)
6. Find the 15^{th} term of the A.P. 1,4,7,… (K)
7. If A,B,C are the angles of a triangle which are in A.P, then write the value of B. (A)
8. Find the fifth term of the G.P. 2,6,18,… (K)
9. Find the common difference of the A.P. $\frac{5}{4}, \frac{3}{4}, \frac{1}{4}, \ldots$ (K)
10. Find the common ratio of the G.P. 2, $2\sqrt{3}$, 6,… (K)
11. Find the arithmetic mean of the numbers 6 and 10. (K)
12. Find the geometric mean of the numbers 4 and 9. (K)

Three mark questions

13. Find the first three terms of the sequence $a_n = (-1)^{n-1} 5^{n+1}$ (K)
14. Find the first three terms of the sequence $a_n = \frac{n(n^2+5)}{4}$ (K)
15. Find the sum of the first three terms of the sequence defined by $a_1 = 3$, $a_n = 3a_{n-1} + 2$(when n>1). (K)
16. In an A.P. if m^{th} term is n and n^{th} term is m, where $m \neq n$, show that p^{th} term is m+n-p. (S)
17. In an A.P. if p^{th} term is $\frac{1}{q}$ and q^{th} term is $\frac{1}{p}$, show that the sum of first pq terms is $\frac{1}{2}(pq+1)$, where $p \neq q$ (S)
18. If the sum of n terms of an A.P. is $nP + \frac{n(n-1)Q}{2}$, where P and Q are constants, find the common difference. (A)
19. The sum of n terms of two arithmetic progressions are in the ratio (3n+8) : (7n+15). Find the ratio of their 12^{th} terms. (S)
20. The sum of n terms of two arithmetic progressions are in the ratio (5n+4) : (9n+6). Find the ratio of their 18^{th} terms. (S)
21. The income of a person is Rs 3,00,000 in the first year and he receives an increment of Rs 10,000 each year for the next 19 years. Find the total amount, he received in 20 years. (A)
22. Find the 6 numbers to be inserted between 3 and 24 such that the resulting sequence is an A.P.(U)
23. Find the 5 numbers to be inserted between 8 and 26 such that the resulting sequence is an A.P. (U)
24. Find the sum of odd integers from 1 to 2001. (U)
25. Find the sum of all natural numbers lying between 100 and 1000, which are multiples of 5. (A)
26. In an A.P., the first term is 2 and the sum of the first five terms is one-fourth of the next five terms. Show that 20^{th} term is -112. (S)

27. In the A.P. -6,$\frac{-11}{2}$,-5,... sum to n^{th} terms is -25.Find the value of n. (U)
28. In the A.P. 25,22,19,... sum to n^{th} terms is 116.Find the n^{th} term. (U)

29. Find the sum to 10 terms of the A.P., whose n^{th} term is 5n+1. (A)
30. Find the sum to n terms of the A.P., whose k^{th} term is 5k+1. (A)

31. If the sum to n terms of an A.P is $3n+5n^2$, find the common difference. (A)
32. If the sum to n terms of an A.P is $pn+qn^2$, where p and q are constants. Show that the common difference is 2q. (A)
33. If the sum of first p terms of an A.P. is equal to the sum of first q terms and p, q are distinct, then show that the sum of first (p+q) terms is equal to 0. (S)
34. If the sum of n terms of an A.P is $3n^2 + 5n$ and its m^{th} term is 164, find the value of m. (A)
35. A man starts repaying a loan as first instalment of Rs 1000. If he increases the instalment by Rs 50 every month, what amount he will pay in the 30^{th}instalment? (A)
36. The difference between any two consecutive interior angles of a polygon is 5° . If the smallest angle is120°, find the number of sides of the polygon. (A)
37. In a G.P., the third term is 24 and the 6^{th} term is 192. Find the 10^{th} term. (U)
38. In the G.P. 3,$\frac{3}{2}$,$\frac{3}{4}$,... if S_n= $\frac{3069}{512}$, find the value of n. (U)
39. In the G.P. 3, 3^2, 3^3 ,... if S_n=120, find the value of n. (U)
40. In the G.P. 2, $2\sqrt{2}$, 4... ifa_n = 128, find the value of n. (U)
41. In the G.P. $\sqrt{3}, 3, 3\sqrt{3}$... if a_n = 729, find the value of n. (U)
42. In the G.P. $\frac{1}{3},\frac{1}{9},\frac{1}{27},\ldots$ if $a_n = \frac{1}{729}$, find the value of n. (U)
43. Find the values of x, if the numbers $\frac{-2}{7}$, x, $\frac{-7}{2}$ are in G.P. Also find the common ratios (U)
44. The sum of first three terms of a G.P. is $\frac{13}{12}$ and their product is -1. Find the common ratios. (A)
45. The sum of first three terms of a G.P. is $\frac{39}{10}$ and their product is 1. Find the common ratios. (A)
46. A person has 2 parents, 4 grandparents, 8 great grandparents, and so on. Find the number of his ancestors during the ten generations preceding his own. (A)
47. Find the 3 numbers to be inserted between 1 and 256 such that the resulting sequence is an G.P.(U)
48. Find the 3 numbers to be inserted between 1 and 243 such that the resulting sequence is an G.P.(U)
49. If A and G respectively represents the Arithmetic mean and Geometric mean of two positive real numbers ,then show that A≥G. (S)
50. If A.M. and G.M. of two positive numbers 'a' and 'b' are 10 and 8 , respectively, find the numbers.(A)
51. Find the 12^{th} term of the G.P. whose 8^{th} term is 192 and common ratio is 2. (U)
52. The 5^{th}, 8^{th} and 11^{th} terms of a G.P. are p, q and s respectively. Show that q^2=ps. (A)
53. The 4^{th} term of a G.P. is square of its second term, and the first term is -3. Determine its 7^{th} term. (U)
54. The sum of first three terms of a G.P. is 16 and the sum of next three terms is 128. Determine the first term and the common ratio. (A)
55. Given a G.P with a=729 and 7^{th}term is 64, Determine S_7. (U)
56. In a G.P. if sum of the first two terms is -4 and the fifth term is 4 times the third term. Find the first terms of the G.P. (A)
57. If the 4^{th}, 10^{th} and 16^{th} terms of a G.P. are x, y and z respectively. Prove that x, y, z are in G.P. (A)

Show that the products of the corresponding terms of the sequence, $ar, ar^2, ... ar^{n-1}$ and $A, AR, AR^2, ... AR^{n-1}$ form a G.P. and find the common ratio.

58. Find the sum of the products of the corresponding terms of the sequence 2,4,8,16,32 and 128, 32, 8, 2, $\frac{1}{2}$. (U)
59. Find four numbers forming a G.P. in which the third term is greater than the first term by 9, and the second term is greater than the fourth by 18. (S)
60. If m^{th}, p^{th} and q^{th} terms of a G.P are x, y and z respectively. Prove that $x^{p-q}y^{q-m}z^{m-p} = 1$ (S)
61. If the first and n^{th} term of a G.P. are a and b, respectively, and if P is the product of first n terms, Prove that $P^2 = (ab)^n$. (S)
62. Show that the ratio of the sum of first n terms of a G.P. to the sum of terms from $(n+1)^{th}$ to $(2n)^{th}$ term is $\frac{1}{r^n}$. (S)
63. If a,b,c and d are in G.P. show that $(a^2 + b^2 + c^2)(b^2 + c^2 + d^2) = (ab + bc + cd)^2$. (S)
64. The number of bacteria in a certain culture doubles every hour. If there were 30 bacteria present in the culture originally, how many bacteria will be present at the end of 8^{th} hour? (A)
65. What will Rs 500 amounts to in 10 years after its deposit in a bank which pays annual interest rate of 10% compounded annually? (A)
66. If A.M. and G.M. of roots of a quadratic equation are 8 and 5, respectively, then obtain the quadratic equation. (S)
67. If a, b, c are in G.P. and $a^{\frac{1}{x}} = b^{\frac{1}{y}} = c^{\frac{1}{z}}$, prove that x, y, z are in A.P. (S)
68. Show that the sum of $(m+n)^{th}$ and $(m-n)^{th}$ terms of an A.P. is equal to twice the m^{th} term. (A)
69. If the sum of three numbers in A.P., is 24 and their product is 440, find the numbers. (S)
70. Let the sum of n, 2n, 3n terms of an A.P be S_1, S_2 and S_3 respectively, show that $S_3 = 3(S_2 - S_1)$. (S)
71. Find the sum of all numbers between 200 and 400 which are divisible by 7. (A)
72. Find the sum of all two digit numbers which when divided by 4, yields 1 as reminder. (A)
73. If f is a function satisfying f(x+y)=f(x).f(y) for all x,y ∈ N such that f(1)=3 and $\sum_{x=1}^{n} f(x) = 120$, find the value of n. (S)
74. The sum of some terms of G.P is 315 whose first term and the common ratio are 5 and 2 respectively. Find the last term and the number of terms. (U)
75. The first term of a G.P is 1. The sum of third and fifth term is 90.Find the common ratio of G.P.(U)
76. A G.P. consists of an even number of terms. If the sum of all the terms is 5 times the sum of terms occupying odd places, then find the common ratio. (S)
77. If $\frac{a+bx}{a-bx} = \frac{b+cx}{b-cx} = \frac{c+dx}{c-dx}$ $(x \neq 0)$, then show that a, b, c, d are in G.P. (S)
78. If a,b,c are in A.P.; b,c,d are in G.P. and $\frac{1}{c}, \frac{1}{d}, \frac{1}{e}$ are in A.P. Prove that a, c, e are in G.P. (S)
79. If S_1, S_2, S_3 are the sum of first n natural numbers, their squares and their cubes, respectively, show that $9S_2^2 = S_3(1+8S_1)$. (A)
80. A person writes a letter to four office friends. He asks each one of them to copy the letter and mail to four different persons with instruction that they move the chain similarly. Assuming that the chain is not broken and that it costs 50 paise to mail one letter. Find the amount spent on postage when 8^{th} set of letteris mailed. (A)

81. A man deposited Rs 10000 in a bank at the rate of 5% simple interest annually. Find the amount in 15^{th} yearsince he deposited the amount and also calculate the total amount after 20 years. (A)
82. A manufacturer reckons that the value of a machine, which costs him Rs 15625, will depreciate each year by 20%. Find the estimated value at the end of 5 years. (A)

Four mark questions

83. Find the sum to n terms of the series : 5+11+19+29+41+.... (S)
84. Find the sum of the first n terms of the series: 3+7+13+21+31+... (S)
85. Find the sum to n terms of the series whose n^{th} term is n(n+3) and hence find S_{10}. (K)
86. Find the sum to n terms of the series: 1x2 + 2x3 + 3x4 + 4x5 + ...and hence find S_{12}. (U)
87. Find the sum to n terms of the series: 1x2x3 + 2x3x4 + 3x4x5 + ... (U)
88. Find the sum to n terms of the series: $3x1^2 + 5x2^2 + 7x3^2 + ...$ (U)
89. Find the sum to n terms of the series 3x8 + 6x11 + 9x14 + ... and hence find S_9. (U)
90. Find the sum to n terms of the series: $1^2 + (1^2 + 2^2) + (1^2 + 2^2 + 3^2) + ...$ (U)
91. Find the sum to n terms of the series: $\frac{1}{1x2} + \frac{1}{2x3} + \frac{1}{3x4} + ...$ (S)
92. Find the sum to n terms of the series whose n^{th} term is given by n(n+1)(n+4). (U)
93. Find the sum to n terms of the series whose n^{th} term is given by n^2+2^n.Hence find S_4. (U)
94. Find the sum to n terms of the series whose n^{th} term is given by $(2n-1)^2$.Hence find S_5. (U)
95. Find the sum of the following series up to n terms: $\frac{1^3}{1} + \frac{1^3+2^3}{1+3} + \frac{1^3+2^3+3^3}{1+3+5} + \cdots$ (A)

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CHAPTER-10

STRAIGHT LINES

One mark questions

1. Write the slope of the x – axis . (K)
2. If a line makes an inclination of $\frac{\pi}{3}$ with the positive direction of x–axis , find the slope of the line. (U)
3. Find the slope of the line which makes angle $\frac{\pi}{4}$ with positive direction of y-axis. (A)
4. Find the slope of the line passing through the points (2, 3) and (-5, 8). (K)
5. Find the slope of the line parallel to the line passing through the points (-2, 5) and (4,9). (K)
6. Find the slope of the line perpendicular to the line passing through the points (6,3) and (4,8). (U)
7. Check whether the point (5,-3) lies on the line 2x+3y+5=0 or not? (U)
8. Check whether the point (1, 7) lies on the line 5x-9y+2=0 or not? (U)
9. Acute angle between two lines is 40° . Find the obtuse angle between the same lines. (U)
10. Find the equation of the horizontal line passing through the point (3,5). (K)
11. Find the equation of the vertical line passing through the point (-4,8). (K)
12. Find the equation of the horizontal line intercepting the y- axis 3 units above the origin. (K)
13. Find the equation of the horizontal line intercepting the y- axis 6 units below the origin. (K)
14. Find the equation of the vertical line intercepting the x- axis 1units right of the origin. (K)
15. Find the equation of the vertical line intercepting the x- axis 5 units left of the origin. (K)
16. Write the equation of x axis. (K)
17. Write the equation of y axis. (K)
18. Find the slope of the line 2x+7y+9 = 0 . (K)
19. Find the x-intercept of the line 5x – 3y = 6. (K)
20. Find the y-intercept of the line 8x-y+6 = 0. (K)

Two mark questions

21. Find the slope of a line, which passes through origin, and the midpoint of the line segment joining the points (0, -4) and (8, 0). (U)
22. Line through the points (-2, 6) and (4, 8) is perpendicular to the line through the points (8, 12) and (x, 24).Find the value of x. (U)
23. The line through the points (h, 3) and (4, 1) is perpendicular to the line 7x + 9y + 19 = 0. Find the value of h. (U)
24. Line through the points (5, -6) and (7,-3) is parallel to the line through the points (x, 8) and (5, 24). Find the value of x. (U)
25. Find the value of x for which the points (x, -1), (2, 1) and (4, 5) are collinear. (K)
26. Show that the points (1, 5), (3, 1) and (4, -1) are collinear. (K)
27. Find the angle between the x- axis and the line joining the points (3, -1) and (4, -2). (A)
28. Find the angle between the lines x - $\sqrt{3}$y + 5 = 0 and $\sqrt{3}x - y + 7 = 0$. (K)
29. Find the angle between the lines x – y + 9 = 0 and $x + y + 7 = 0$. (K)
30. Find the angle between the lines $\sqrt{3}$x + y =1 and $x + \sqrt{3}y$ =1. (K)
31. Find the tangent of the angle between the lines 2x+3y-8 = 0 and 5x-y+7 = 0. (K)

32. Find the equation of the line passing through the point (-2, 3) with slope -4. (K)

33. Find the equation of the line passing through the point (-4, 3) with slope $\frac{1}{2}$. (K)

34. Find the equation of the line passing through the point (0,0) with slope 8. (K)

35. Find the equation of the line passing through the point (-2, -9) and inclined with x axis at an angle 45°. (U)

36. Find the equation of the line passing through the point $(2, 2\sqrt{3})$ and inclined with x axis at an angle 75°. (U)

37. Find the equation of the line intersecting x axis at distance 3 units to the left of origin with slope -2. (U)

38. Find the equation of the line intersecting y axis at a distance 2 units above the origin and making an angle 30° with positive direction of x axis. (U)

39. Find the equation of the line passing through the points (1, -1) and (3, 5). (K)

40. Find the equation of the line passing through the points (-1, 1) and (2, -4). (K)

41. Find the equation of the line with slope 2 and y- intercept 3. (K)

42. Find the equation of the line for which $\tan\theta = \frac{1}{2}$, where θ is the inclination of the line and y- intercept $\frac{-3}{2}$. (K)

43. Find the equation of the line with slope $\frac{-1}{3}$ and x- intercept -3. (U)

44. Find the equation of the line, which makes intercepts -3 and 2 on the x and y axes respectively. (K)

45. Find the equation of the line whose perpendicular distance from the origin is 5 units and the angle made by the perpendicular with the positive x axis is 30°. (K)

46. Find the equation of the median of the triangle PQR through the vertex R whose vertices are given by P(2,1), Q(-2,3), R(4,5). (U)

47. Find the equation of the line passing through (-3, 5) and perpendicular to the line through the points (2,5) and (-3,6). (U)

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

49. The perpendicular from the origin to a line meets it at the point (-2, 9), find the equation of the line. (A)

50. Show that the points (3,0), (-2, -2) and (8,2) are collinear. (U)

51. If P(2,4) is the midpoint of line segment between the axes, find the equation of the line. (A)

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

53. Find the equation of the line perpendicular to the line 6x+5y+2 = 0 and passing through the point (5, 2). (U)

54. Find the equation of the line perpendicular to the line 3x-5y+9 = 0 and passing through the point (-1,8). (U)

55. Find the equation of the line perpendicular to the line x-7y+5 = 0 and having x-intercept 3. (U)

56. Find the equation of the line parallel to the line 5x+3y+1 = 0 and having y-intercept 8. (U)

57. Reduce the equation 6x+3y-5=0 into slope–intercept form and find the slope and y-intercept of the line. (U)

58. Reduce the equation 3x-4y-5=0 into slope–intercept form and find the slope and y-intercept of the line. (U)

59. Reduce the equation x+7y =0 into slope–intercept form and find the slope and y-intercept of the line. (U)

60. Reduce the equation 3x+2y-12=0 into intercept form and find the values of x and y intercepts.(U)

61. Reduce the equations $x-\sqrt{3}y+8=0, y-2=0$ and $x-y=4$ in to normal form. Find their perpendicular distances from the oigin and angle between perpendicular and the positive $x-$axis. (U)

62. Reduce the equation 4x-3y=6 into intercept form and find the values of x and y intercepts. (U)

63. Find the distance of the point (-1,1) from the line 12x-5y+82=0. (K)

64. Find the distance of the point (3, -5) from the line 3x-4y-26=0. (K)

65. Find the distance between the parallel lines 3x-4y+7=0 and 3x-4y+5=0. (K)

66. Find the distance between the parallel lines 15x+8y-34=0 and 15x+8y+30 = 0. (K)

67. Find the equation of right bisector(perpendicular bisector) of the line segment joining the points(3,4) and (-1,2). (A)

68. In the triangle ABC with vertices A(2,3), B(4,-1) and C(1,2), find the equation of the altitude from the vertex A. (A)

69. Find the point of intersection of the lines 2x+3y-7 = 0 and x-4y+7 = 0. (U)

Five mark questions

70. Derive an expression for the acute angle between two lines having slopes m_1 and m_2 and hence find the acute angle between the lines x+y-6=0 and x-y -5=0. (U)

71. Derive the equation of the line having slope ‘m’ and passing through the point (x_0, y_0) and hence find the equation of the line having slope 3 and passing through the point (3,-1). (U)

72. Derive the equation of the line passing through the points (x_1, y_1) and (x_2, y_2) hence find the equation of the line passing through the points (4,7) and (-3, 8). (U)

73. Derive the equation of the line having slope ‘m’ and y- intercept ‘c’ and hence find the equation of the line having slope -2 and y- intercept 4. (U)

74. Derive the equation of the line having x and y- intercept values as ‘a’ and ‘b’ respectively and hence find the equation of the line having x and y- intercept values as 2 and 6 respectively. (U)

75. Derive the equation of the line in normal form. (U)

76. Derive an expression for the perpendicular distance between a point and a line. (U)

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CHAPTER - 11

CONIC SECTIONS

3 marks questions

Find the centre and radius of the following equation of the circles

1) $x^2 + y^2 + 8x + 10y - 8 = 0.$ (U)

2) $x^2 + y^2 - 8x + 10y - 12 = 0.$ (U)

3) $x^2 + y^2 - 4x - 8y - 45 = 0.$ (U)

4) $2x^2 + 2y^2 - x = 0.$ (U)

5) Find the equation of the circle which passes through (2, -2) and (3, 4) and whose centre lies on the line x + y=2. (U)

6) Find the equation of the circle which passes through (4, 1) and (6, 5) and whose centre lies on the line 4x+y=16. (U)

7) Find the equation of the circle which passes through (2, 3) and (-1, 1) and whose centre lies on the line x-3y-11=0. (U)

8) Find the equation of the circle with radius 5 whose centre lies on x-axis and passes through the point (2, 3). (U)

9) Find the equation of the circle passing through (0, 0) and making intercepts 'a' and 'b' on the coordinate axes. (U)

10) Find the coordinates of the focus, axis, and the equation of the directrix of the parabola $y^2 = 8x.$ (U)

11) Find the coordinates of the focus, axis, and the equation of the directrix of the parabola $y^2 = 12x.$ (U)

12) Find the coordinates of the focus, axis, and the equation of the directrix of the parabola $y^2 = 10x.$ (U)

13) Find the coordinates of the focus, axis, and the equation of the directrix of the parabola $y^2 = -8x.$ (U)

14) Find the coordinates of the focus, axis, and the equation of the directrix of the parabola $x^2 = 6y.$ (U)

15) Find the coordinates of the focus, axis, and the equation of the directrix of the parabola $x^2 = -16y.$ (U)

16) Find the coordinates of the focus, axis, and the equation of the directrix of the parabola $x^2 = -9y$. (U)

17) Find the coordinates of the focus, the equation of the directrix and latus rectum of the parabola $y^2 = 8x$. (U)

18) Find the coordinates of the focus, the equation of the directrix and latus rectum of the parabola $y^2 = 12x$. (U)

19) Find the coordinates of the focus, the equation of the directrix and latus rectum of the parabola $y^2 = 10x$. (U)

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

21) Find the coordinates of the focus, , the equation of the directrix and latus rectum of the parabola $x^2 = 6y$. (U)

22) Find the coordinates of the focus, the equation of the directrix and latus rectum of the parabola $x^2 = -16y$. (U)

23) Find the coordinates of the focus, , the equation of the directrix and latus rectum of the parabola $x^2 = -9y$. (U)

24) Find the equation of the parabola given that vertex (0, 0), passing through (2, 3) and axis is along x-axis (U)

25) Find the equation of the parabola given that vertex (0, 0), passing through (5, 2) and symmetric with respect to y-axis. (U)

26) Find the foci, eccentricity and Latus rectum of the ellipse $\frac{x^2}{25} + \frac{y^2}{9} = 1$. (U)

27) Find the foci, eccentricity and Latus rectum of the ellipse $\frac{x^2}{36} + \frac{y^2}{16} = 1$. (U)

28) Find the foci, eccentricity and Latus rectum of the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$. (U)

29) Find the foci, eccentricity and Latus rectum of the ellipse $\frac{x^2}{49} + \frac{y^2}{36} = 1$. (U)

30) Find the foci, eccentricity and Latus rectum of the ellipse $\frac{x^2}{4} + \frac{y^2}{25} = 1$. (U)

31) Find the foci, eccentricity and Latus rectum of the ellipse $\frac{x^2}{25} + \frac{y^2}{100} = 1$. (U)

32) Find the foci, eccentricity and Latus rectum of the ellipse $\frac{x^2}{100} + \frac{y^2}{400} = 1$. (U)

33) Find the foci, eccentricity and Latus rectum of the ellipse $9x^2 + 4y^2 = 36$. (U)

34) Find the foci, eccentricity and Latus rectum of the ellipse $36x^2 + 4y^2 = 144$. (U)

35) Find the foci, eccentricity and Latus rectum of the ellipse $16x^2 + y^2 = 16$. (U)

36) Find the foci, eccentricity and Latus rectum of the ellipse $4x^2 + 9y^2 = 36$. (U)

37) Find the vertices, length of major axis, minor axis, and eccentricity of the ellipse $\frac{x^2}{25} + \frac{y^2}{9} = 1$.(U)

38) Find the vertices, length of major axis, minor axis, and eccentricity of the ellipse $\frac{x^2}{36} + \frac{y^2}{16} = 1$.(U)

39) Find the vertices, length of major axis, minor axis, and eccentricity of the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$.(U)

40)Find the vertices, length of major axis, minor axis, and eccentricity of the ellipse $\frac{x^2}{49} + \frac{y^2}{36} = 1$.(U)

41) Find the vertices, length of major axis, minor axis, and eccentricity of the ellipse $\frac{x^2}{4} + \frac{y^2}{25} = 1$.(U)

42) Find the vertices, length of major axis, minor axis, and eccentricity of the ellipse $\frac{x^2}{25} + \frac{y^2}{100} = 1$. (U)

43) Find the vertices, length of major axis, minor axis, and eccentricity of the ellipse $\frac{x^2}{100} + \frac{y^2}{400} = 1$. (U)

44)Find the vertices, length of major axis, minor axis, and eccentricity of the ellipse

$9x^2 + 4y^2 = 36$. (U)

45) Find the vertices, length of major axis, minor axis, and eccentricity of the ellipse

$36x^2 + 4y^2 = 144$. (U)

46) Find the vertices, length of major axis, minor axis, and eccentricity of the ellipse

$16x^2 + y^2 = 16$. (U)

47) Find the vertices, length of major axis, minor axis, and eccentricity of the ellipse

$4x^2 + 9y^2 = 36$. (U)

48) Find the equation of the ellipse given that Vertices$(\pm 5,\ 0)$ and foci$(\pm 4,\ 0)$. (U)

49)Find the equation of the ellipse given that Vertices$(\pm 13,\ 0)$ and foci$(\pm 5,\ 0)$. (U)

50)Find the equation of the ellipse given that Vertices$(\pm 6,\ 0)$ and foci$(\pm 4,\ 0)$. (U)

51)Find the equation of the ellipse given that Vertices$(0,\ \pm 13)$ and foci$(0,\ \pm 5)$. (U)

52) Find the equation of the ellipse given that Length of major axis is 26 and foci $(\pm 5,\ 0)$. (U)

53) Find the equation of the ellipse given that Length of major axis is 20 and foci$(0, \pm 5)$. (U)

54) Find the equation of the ellipse given that Length of major axis is 16 and foci$(0, \pm 6)$. (U)

55)Find the equation of the ellipse given that Foci$(\pm 3,\ 0)$ and length of semi major axis is 4. (U)

56) Find the equation of the ellipse given that Centre at (0, 0), major axis on the x-axis and passing through the points (4, 3) and (-1, 4). (U)

57) Find the equation of the ellipse given that Centre at (0, 0) , major axis on the x-axis and passing through the points (4, 3) and (6,2). (U)

58)Find the equation of the ellipse given that Centre at (0, 0), major axis on the y-axis and passing through the points (3, 2) and (1, 6). (U)

59) Find the foci , the eccentricity and the length of the latus rectum of the hyperbola $\frac{x^2}{9} - \frac{y^2}{16} = 1$.(U)

60) Find the foci, the eccentricity and the length of the latus rectum of the hyperbola $\frac{x^2}{16} - \frac{y^2}{9} = 1$.(U)

61) Find the foci , the eccentricity and the length of the latus rectum of the hyperbola $16x^2 - 9y^2 = 576$. (U)

62) Find the foci , the eccentricity and the length of the latus rectum of the hyperbola $\frac{y^2}{9} - \frac{x^2}{27} = 1$.(U)

63) Find the foci , the eccentricity and the length of the latus rectum of the hyperbola $9y^2 - 4x^2 = 36$. (U)

64) Find the foci , the eccentricity and the length of the latus rectum of the hyperbola $5y^2 - 9x^2 = 36$. (U)

65) Find the foci, the eccentricity and the length of the latus rectum of the hyperbola $49y^2 - 16x^2 = 784$. (U)

66) Find the foci, the eccentricity and the length of the latus rectum of the hyperbola $y^2 - 16x^2 = 16$. (U)

67) Find the foci, vertices and the length of the latus rectum of the hyperbola $\frac{x^2}{9} - \frac{y^2}{16} = 1$. (U)

68) Find the foci , vertices and the length of the latus rectum of the hyperbola $\frac{x^2}{16} - \frac{y^2}{9} = 1$. (U)

69) Find the foci, vertices and the length of the latus rectum of the hyperbola $16x^2 - 9y^2 = 576$. (U)

70) Find the foci , vertices and the length of the latus rectum of the hyperbola $\frac{y^2}{9} - \frac{x^2}{27} = 1$. (U)

71) Find the foci , vertices and the length of the latus rectum of the hyperbola $9y^2 - 4x^2 = 36$.(U)

72) Find the foci , vertices and the length of the latus rectum of the hyperbola $5y^2 - 9x^2 = 36$. (U)

73) Find the foci , vertices and the length of the latus rectum of the hyperbola $49y^2 - 16x^2 = 784$.(U)

74) Find the foci , vertices and the length of the latus rectum of the hyperbola $y^2 - 16x^2 = 16$.(U)

75) Find the equation of the hyperbola given that Vertices $(\pm 2,\ 0)$and foci$(\pm 3,\ 0)$. (U)

76) Find the equation of the hyperbola given that Vertices $(0,\ \pm 5)$and foci$(0,\ \pm 8)$. (U)

77) Find the equation of the hyperbola given that Vertices $(0,\ \pm 3)$ and foci $(0,\ \pm 5)$. (U)

78) Find the equation of the hyperbola given that Vertices $\left(0,\ \frac{\pm\sqrt{11}}{2}\right)$and foci$(0,\ \pm 3)$. (U)

79) Find the equation of the hyperbola given that Foci $(\pm 5,\ 0)$ and the transverse axis is of length 8.(U)

80) Find the equation of the hyperbola given that Foci $(0,\ \pm 13)$and conjugate axis is of length 24.(U)

81) Find the equation of the hyperbola given that Foci $\left(\pm 3\sqrt{5}\ ,\ 0\right)$and latus rectum is of length 8.(U)

82) Find the equation of the hyperbola given that Foci $(\pm 4\ ,\ 0)$and the latus rectum is of length 12.(U)

83) Find the equation of the hyperbola given that Foci $(0,\ \pm 12)$and latus rectum is of length 36 (U)

84) Find the equation of the hyperbola given that Vertices$(\pm 7, 0)$, $e = \frac{4}{3}$. (U)

85) Find the equation of the hyperbola given that Foci$\left(0, \pm\sqrt{10}\right)$, passing through (2, 3). (U)

86) The focus of a parabolic mirror is at a distance of 5 cm from its vertex. If the mirror is 45 cm deep, find the diameter of the parabola. (A)

87) An arch is in the form of a parabola with its axis vertical. The arch is 10 m high and 5 m wide at the base. How wide is it 2 m from the vertex of the parabola? (A)

88) A beam is supported at its ends by supports which are 12metres apart. Since the rod is concentrated at its centre, there is a deflection of 3 cm at the centre and the deflected beam is in the shape of a parabola. How far from the centre is the deflection 1 cm? (A)

89) The cable of a uniformly loaded suspension bridge hangs in the form of a parabola. The roadway which is horizontal and 100 m long is supported by vertical wires attached to the cable, the longest wire being 30 m and the shortest being 6 m. Find the length of a supporting wire attached to the roadway 18 m from the middle. (A)

90) Find the area of the triangle formed by the lines joining the vertex of the parabola $x^2 = 12y$ to the ends of its latus rectum. (A)

91) An equilateral triangle is inscribed in the parabola $y^2 = 4ax$, where one vertex is at the vertex of the parabola. Find the length of the side of the triangle. (S)

92) A rod AB of length 15 cm rests in between two coordinate axes in such a way that the end point A lies on x-axis and end point B lies on y-axis. A point P(x, y) is taken on the rod in such a way that AP=6 cm. Show that the locus of P is an ellipse. (S)

93) A rod of length 12 cm moves with its ends always touching the coordinate axes. Determine the equation of the locus of a point P on the rod, which is 3 cm from the end in contact with the x-axis. (S)

94) A man running a racecourse notes that the sum of the distances from the two flag posts from him is always 10 m and the distance between the flag posts is 8 m. Find the equation of the posts traced by the man. (S)

95) An arch is in the form of a semi-ellipse. It is 8m wide and 2 m high at the centre. Find the height of the arch at a point 1.5 m from one end. (S)

6 marks questions

96)Define the Ellipse as set of points and derive the equation of the ellipse in the form $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$. $(a > b)$. (K)

97) Define the Hyperbola as set of points and derive the equation of the hyperbola in the form $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1.$ (K)

98) Define the Parabola and derive the equation of the parabola in the form $y^2 = 4ax$. Find the length of the Latus Rectum. (K)

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CHAPTER 12

Introduction to Three Dimensional Geometry

One mark questions:

1. The three coordinate planes divide the space into how many pats? What are they known as?(K)

2. What are the coordinates of any point on X-axis? (U)
3. What are the coordinates of any point on Y-axis? (U)
4. What are the coordinates of any point on Z-axis? (U)
5. A point is on the X-axis. What are its y and z coordinates? (U)
6. A point is in the XZ plane, what can you say about its y coordinate? (U)
7. Name the plane determined by X and Y axes taken together. (U)
8. What are the coordinates of any point in the XY-plane? (U)
9. What are the coordinates of any point in the YZ-plane? (U)
10. What are the coordinates of any point in the XZ-plane? (U)
11. Name the octant in which the point (2,-4,-7) lie. (K)
12. Find the distance of the point (3, 4, 5) from the origin. (K)
13. If the distance of the point (2, 1, k) from the origin is 3, then find k. (K)
14. Find the coordinates of the mid-point of the line joining the points (1, -2, 1) and (-3, 8, 3). (K)
15. Find the coordinates of the centroid of a triangle whose vertices are (2,-3, 1), (1, 0, -1) and (3, 6, 0). (K)

Two marks questions:

1. Find the distance between the points P (1,-3,4) and Q (-4,1,2). (K)
2. Find the equation of the set of points P such that its distances from the points A (3, 4,-5) and B (-2, 1, 4) are equal. (S)
3. Find the equation of the set of points P such that $PA^2 + PB^2 = 2K^2$, where A and B are the points (3, 4, 5) and (-1, 3, -7) respectively. (S)

Three marks questions:

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

2. Are the points A(3,6,9), B(10,20,30) and C(25,-41,5),the vertices of a right angled triangle.(A)

3. Show that the points (-1,2,1),(1,-2,5),(4,-7,8) and (2,-3,4) are the vertices of a parallelogram.(A)

4. Show that the points (0,7,-10),(1,6,-6) and (4,9,-6) are the vertices of an isosceles triangle. (A)

5. Find the equation of the set of points P, the sum of whose distances from A (4, 0, 0) and B (-4, 0, 0) is equal to 10. (S)

6. The centroid of a triangle ABC is (1, 1, 1).If the coordinates of A and B are (3,-5, 7) and (-1, 7,-6) respectively, find the coordinates of the point C. (S)

7. Find the coordinates of the point which trisect the line segment joining the points P(4,2,-6) and Q(10,-16,6). (S)

Five marks questions:

1. Derive the formula to find the coordinates of the point which divides the line segment joining thepoints (x_1, y_1, z_1) and (x_2,y_2,z_2) in the ratio m:n internally. (K)

2. Find the coordinates of the point which divides the line segment joining the point (1,-2, 3) and (3,4,-5) in the ratio 2:3 (i) internally and (ii) externally. (K)

3. Using section formula, prove that the three points (-4,6,10),(2,4,6)and (4,0,-2)are collinear. (A)

4. Given that P(3,2,-4),Q(5,4,-6)and R(9,8,-10) are collinear. Find the ratio in which Q divides PR. Also find the coordinates of Q. (S)

5. Find the ratio in which the line segment joining the points (4, 8, 10) and (6, 10, -8) is divided by the YZ - plane. (S)

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CHAPTER-13
LIMITS AND DERIVATIVES

LIMITS

1. Find $\lim_{x\to 2} f(x)$ where $f(x)=3$. (K)

2. Find $\lim_{x\to 1}(x^2+x)$. (U)

3. Evaluate: $\lim_{x\to 1}\left[x^3-x^2+1\right]$. (U)

4. Evaluate: $\lim_{x\to 3}\left[x(x+1)\right]$. (U)

5. Evaluate: $\lim_{x\to 3}\left[x+3\right]$. (U)

6. Evaluate: $\lim_{x\to \pi}\left(x-\frac{22}{7}\right)$. (U)

7. Evaluate: $\lim_{r\to 1}\pi r^2$. (U)

8. Evaluate: $\lim_{x\to 4}\frac{4x+3}{x-2}$. (U)

9. Evaluate: $\lim_{x\to -1}\frac{x^{10}+x^5+1}{x-1}$. (U)

10. Evaluate: $\lim_{x\to 0}\frac{ax+b}{cx+1}$. (U)

11. Evaluate: $\lim_{x\to 0}\frac{\cos x}{(\pi-x)}$. (U)

12. Evaluate: $\lim_{x\to 0} x\sec x$. (U)

TWO MARK QUESTIONS

1. Discuss the limit of the function $f(x)=x+10$ at $x=5$. (K)

2. Discuss the limit of the function $f(x)=x^3$ at $x=1$. (K)

3. Find $\lim_{x\to 2} f(x)$ where $f(x)=3x$. (K)

4. Evaluate: $\lim_{x\to 1}\left[\frac{x^2+1}{x+100}\right]$. (U)

5. Evaluate: $\lim_{x\to 1}\frac{x^{15}-1}{x^{10}-1}$. (S)

6. Evaluate: $\lim_{x\to 2}\frac{\sqrt{1+x}-1}{x}$. (S)

7. Evaluate: $\lim_{x\to 0}\frac{1-\cos x}{x}$. (S)

8. Evaluate: $\lim_{x\to 0}\dfrac{\sin 4x}{\sin 2x}$. (U)

9. Evaluate: $\lim_{z\to 1}\dfrac{z^{\frac{1}{3}}-1}{z^{\frac{1}{6}}-1}$. (S)

10. Evaluate: $\lim_{x\to 1}\dfrac{ax^2+bx+c}{cx^2+bx+a}$, $a+b+c\neq 0$. (K)

11. Evaluate: $\lim_{x\to -2}\dfrac{\frac{1}{x}+\frac{1}{2}}{x+2}$. (S)

12. Evaluate: $\lim_{x\to 0}\dfrac{\sin ax}{bx}$. (U)

13. Evaluate: $\lim_{x\to 0}\dfrac{\sin ax}{\sin bx}$. *(S)*

THREE MARK QUESTIONS

1. Find $\lim_{x\to 0} f(x)$, where $f(x)=\begin{cases} x-2, & x<0 \\ 0, & x=0 \\ x+2, & x>0 \end{cases}$. (K)

2. Find $\lim_{x\to -1}\left[1+x+x^2+\ldots\ldots+x^{10}\right]$. (U)

3. Evaluate: $\lim_{x\to 2}\left[\dfrac{x^3-4x^2+4x}{x^2-4}\right]$. (S)

4. Evaluate: $\lim_{x\to 2}\left[\dfrac{x^2-4}{x^3-4x^2+4x}\right]$. (S)

5. Evaluate: $\lim_{x\to 2}\left[\dfrac{x^3-2x^2}{x^2-5x+6}\right]$. (S)

6. Evaluate: $\lim_{x\to 1}\left[\dfrac{x-2}{x^2-x}-\dfrac{1}{x^3-3x^2+2x}\right]$. (S)

7. For any positive integer n, prove that, $\lim_{x\to a}\dfrac{x^n-a^n}{x-a}=na^{n-1}$. (K)

8. Evaluate: $\lim_{x\to 0}\dfrac{(x+1)^5-1}{x}$. (S)

9. Evaluate: $\lim_{x\to 2}\dfrac{3x^2-x-10}{x^2-4}$. (S)

10. Evaluate: $\lim_{x\to 3}\dfrac{x^4-81}{2x^2-5x-3}$. (S)

11. Evaluate: $\lim_{x\to \pi}\dfrac{\sin(\pi-x)}{\pi(\pi-x)}$. (U)

12. Evaluate: $\lim_{x\to 0}\dfrac{\cos 2x-1}{\cos x-1}$. (S)

13. Evaluate: $\lim_{x\to 0}\dfrac{ax+x\cos x}{b\sin x}$. (A)

14. Evaluate: $\lim_{x\to 0}\frac{\sin ax+bx}{ax+\sin bx}, a,b \ and \ a+b\neq 0$. (S)

15. Evaluate: $\lim_{x\to 0}(\operatorname{cosec} x-\cot x)$. (K)

16. Evaluate: $\lim_{x\to\frac{\pi}{2}}\frac{\tan 2x}{x-\frac{\pi}{2}}$. (U)

17. Find $\lim_{x\to 5}f(x)$, where $f(x)=|x|-5$. (K)

FOUR MARK QUESTIONS

1. Find $\lim_{x\to 0}f(x)$ where $f(x)=\begin{cases}2x+3, & if \ \ x\leq 0\\ 3(x+1), & if \ \ x>0\end{cases}$. (K)

2. Find $\lim_{x\to 1}f(x)$, where $f(x)=\begin{cases}2x+3, & if \ \ x\leq 1\\ 3(x+1), & if \ \ x>1\end{cases}$. (K)

3. Find $\lim_{x\to 1}f(x)$, where $f(x)=\begin{cases}x^2-1, & if \ x\leq 1\\ -x^2-1, & if \ x>1\end{cases}$. (K)

4. Find $\lim_{x\to 0}f(x)$, where $f(x)=\begin{cases}\frac{|x|}{x}, & if \ x\neq 0\\ 0, & if \ x=0\end{cases}$. (K)

5. Find $\lim_{x\to 0}f(x)$, where $f(x)=\begin{cases}\frac{x}{|x|}, & if \ x\neq 0\\ 0, & if \ x=0\end{cases}$. (K)

6. Suppose $f(x)=\begin{cases}a+bx, & x<1\\ 4, & x=1\\ b-ax, & x>1\end{cases}$ and $\lim_{x\to 1}f(x)=f(1)$ what are possible values of 'a' and 'b'? (S)

7. If $f(x)=\begin{cases}|x|+1, & x<0\\ 0, & x=0\\ |x|-1, & x>0\end{cases}$, for what value(s) of 'a' does $\lim_{x\to a}f(x)$ exists? (S)

8. If the function $f(x)$ satisfies $\lim_{x\to 1}\frac{f(x)-2}{x^2-1}=\pi$, evaluate $\lim_{x\to 1}f(x)$. (S)

FIVE MARK QUESTIONS

1. Prove geometrically that $\lim_{\theta\to 0}\frac{\sin\theta}{\theta}=1$, θ is in radian and hence deduce that $\lim_{\theta\to 0}\frac{\tan\theta}{\theta}=1$. (K)

DERIVATIVES

ONE MARK QUESTIONS

1. Find the derivative at $x=2$ of the function $f(x)=3x$. (K)

2. Find the derivative of the constant function $f(x) = a$ for a fixed real number 'a'.(U)

3. Find the derivative of $f(x) = 2x - \frac{3}{4}$. (K)

4. Find the derivative of the function: $f(x) = \sec x$. (K)

5. Find the derivative of the function: $f(x) = \text{cosec}\, x$. (K)

6. Find the derivative of $f(x) = x + \frac{1}{x}$. (U)

7. Find the derivative of $f(x) = \sin x + \cos x$. (U)

8. Find the derivative of $y = -x$. (U)

9. Find the derivative of $f(x) = (-x)^{-1}$. (K)

10. Find the derivative of $y = (x + a)$. (K)

TWO MARK QUESTIONS

1. Find the derivative of $sin\, x \ at \ x = 0$. (U)

2. Find the derivative of $f(x) = 3 \ at \ x = 0$. (U)

3. Find the derivative of $f(x) = 3 \ at \ x = 3$. (U)

4. Find the derivative of $f(x) = 10x$. (K)

5. Find the derivative of $f(x) = x^2$. (K)

6.If $f(x) = 10x$, find $f'(x)$. (K)

7. Compute the derivative of $6x^{100} - x^{55} + x$. (S)

8. Find the derivative of $x^2 - 2 \ at \ x = 10$. (K)

9. Find the derivative of $99x \ at \ x = 100$. (K)

10. Find the derivative of $x \ at \ x = 1$. (K)

11. Find the derivative of the function: $f(x) = x^3 - 27$. (U)

12. Find the derivative of the function: $f(x) = (x-1)(x-2)$. (U)

13. Find the derivative of the function: $f(x) = \sin x \cos x$. (U)

14. Find the derivative of the function: $f(x) = 5\sec x + 4\cos x$, (U)

15. Find the derivative of the function: $f(x) = 3\cot x + 5\,\text{cosec}\, x$. (U)

16. Find the derivative of the function: $f(x) = 5\sin x - 6\cos x + 7$. (U)

17. Find the derivative of the function: $f(x) = 2\tan x - 7\sec x$. (U)

18. Find the derivative of $f(x) = x\sin x$. (U)

19. Find the derivative of $y = 4\sqrt{x} - 2$. (U)

THREE MARK QUESTIONS

1. Find the derivative of $f(x) = \frac{1}{x}$. (U)

2.Prove that derivative of the function $f(x)=x$ is the constant function 1. (K)

3. Prove that derivative of $f(x)=x^n$ is $n\,x^{n-1}$ for any positive integer n. (K)

4. Find the derivative of $f(x)=1+x+x^2+x^3+......+x^{50}$ at $x=1$. (S)

5. Find the derivative of $f(x)=\frac{x+1}{x}$. (U)

6. Compute the derivative of $\sin x$. (U)

7. Compute the derivative of $\cos x$. (U)

8. Compute the derivative of $\tan x$. (U)

9. Compute the derivative of $\cot x$. (U)

10. Compute the derivative of $\sec x$. (U)

11. Compute the derivative of $\operatorname{cosec} x$. (U)

12. Compute the derivative of $\sin(x+1)$. (S)

13. Compute the derivative of $\cos\left(x-\frac{\pi}{8}\right)$. (S)

14. Compute the derivative of $f(x)=\sin^2 x$. (U)

15. For some constant 'a' and 'b', find the derivative of $f(x)=(x-a)(x-b)$. (U)

16. For some constant 'a' and 'b', find the derivative of $f(x)=(ax^2+b)^2$. (U)

17. For some constant 'a' and 'b', find the derivative of $f(x)=\frac{x-a}{x-b}$. (U)

18. Find the derivative of $\frac{x^n-a^n}{x-a}$ for some constant 'a'. (U)

19. Find the derivative of $\frac{2}{x+1}-\frac{x^2}{3x-1}$. (S)

20. Find the derivative of $(5x^3+3x-1)(x-1)$. (U)

21. Find the derivative of $x^{-3}(5+3x)$. (U)

22. Find the derivative of $x^5\left(3-6x^{-9}\right)$. (U)

23. Find the derivative of $x^{-4}\left(3-4x^{-5}\right)$. (U)

24. Find the derivative of the function: $f(x)=\frac{1}{x^2}$. (U)

25. Find the derivative of the function: $f(x)=\frac{x+1}{x-1}$. (U)

26. Find the derivative of $f(x)=\frac{2x+3}{x-2}$. (U)

27. Compute derivative of $f(x)=\sin 2x$. (S)

28. Compute derivative of $f(x)=\cot x$. (U)

29. Find the derivative of $y=(px+q)\left(\frac{r}{x}+s\right)$. (U)

30. Find the derivative of $y=(ax+b)\left(cx+d\right)^2$. (U)

31. Find the derivative of $y=\frac{a}{x^4}-\frac{b}{x^2}+\cos x$. (U)

32. Find the derivative of $y = \sin(x+a)$. (S)

33. Find the derivative of $y = \operatorname{cosec} x \cot x$. (U)

34. Find the derivative of $y = x^4(5\sin x - 3\cos x)$. (U)

35. Find the derivative of $y = (x^2+1)\cos x$. (U)

36. Find the derivative of $y = (ax^2 + \sin x)(p + q\cos x)$. (U)

37. Find the derivative of $y = (x+\cos x)(x+\tan x)$. (U)

38. Find the derivative of $y = (x+\sec x)(x-\tan x)$. (U)

FOUR MARK QUESTIONS

1. Find the derivative of the function $f\left(x\right) = 2x^2 + 3x - 5$ *at* $x = -1$. Also prove that $f'\left(0\right) + 3f'\left(-1\right) = 0$. (A)

2. For the function $f(x) = \frac{x^{100}}{100} + \frac{x^{99}}{99} + ...\frac{x^2}{2} + x + 1.$ prove that $f'(1) = 100f'(0)$.(A)

3. Find the derivative of $f(x) = \frac{x^5 - \cos x}{\sin x}$. (U)

4. Find the derivative of $f(x) = \frac{x + \cos x}{\tan x}$. (U)

5. Find the derivative of $f(x) = \frac{x + \cos x}{\tan x}$. (U)

5. Find the derivative of $y = \frac{ax+b}{cx+d}$. (U)

6. Find the derivative of $y = \frac{1+\frac{1}{x}}{1-\frac{1}{x}}$. (U)

7. Find the derivative of $y = \frac{1}{ax^2+bx+c}$. (U)

8. Find the derivative of $y = \frac{ax+b}{px^2+qx+r}$. (U)

9. Find the derivative of $y = \frac{px^2+qx+r}{ax+b}$. (U)

16. Find the derivative of $y = \frac{\cos x}{1+\sin x}$. (U)

17. Find the derivative of $y = \frac{\sin x + \cos x}{\sin x - \cos x}$. (U)

18. Find the derivative of $y = \frac{\sec x - 1}{\sec x + 1}$. (U)

20. Find the derivative of $y = \frac{a + b\sin x}{c + d\cos x}$. (U)

21. Find the derivative of $y = \frac{\sin(x+a)}{\cos x}$. (S)

26. Find the derivative of $y = \dfrac{4x + 5\sin x}{3x + 7\cos x}$. (U)

27. Find the derivative of $y = \dfrac{x^2 \cos\left(\dfrac{\pi}{4}\right)}{\sin x}$. (U)

28. Find the derivative of $y = \dfrac{x}{1 + \tan x}$. (U)

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CHAPTER-14
MATHEMATICAL REASONING

ONE MARKS QUESTION

1. Define mathematically acceptable statement. (K)

2. Define negation of a statement. (K)

3. Define a compound statement. (K)

4. Write the negation of “New Delhi is a city”. (U)

5. Write the negation of “Both the diagonals of a rectangle have the same length”. (U)

6. Write the negation of “ $\sqrt{7}$ is rational”. (U)

7. Write the negation of “There does not exist a quadrilateral which has all its sides are equal”. (U)

8. Write the negation of “Every natural number is greater than zero”. (U)

9. Define converse of the statement. (K)

10. DefineContra positive of the statement. (K)

11. Write the negation of “Everyone in Germany speaks German”. (U)

12. Write the negation of “Chennai is the capital of Tamil Nadu”. (U)

13. Write the negation of “All triangles are not equilateral triangle” (U)

14. Write the negation of “The number 2 is greater than 7”. (U)

15. Write the negation of “Every natural number is an integer”. (U)

16. Define quantifiers. (K)

17. Write the statement “You get a job implies that your credentials are good” in the form ‘If-then’. (U)

18. Write the statement “The Banana trees will bloom if it stays warm for a month” in the form ‘If-then’. (U)

19. Write the statement “A quadrilateral is a parallelogram if its diagonals bisect each other” in the form ‘If-then’. (U)

20. Write the statement “To get an A^+ in the class, if it is necessary that you do all the exercise of the book”. (U)

21. Write the negation of the "For every positive real number x, the number x-1 is also positive" (U)

22. Write the negation of the "All cats scratch". (U)

23. Write the negation of the "For every real number x, either $x>1$ or $x<1$" (U)

24. Write the negation of the"there exists a number x such that $0<x<1$" (U)

25. Write the contra positive of the statement: "If a number is divisible by 9, then it is divisible by 3." (U)

26. Write the contra positive of the statement: "If you are born in India, then you are a citizen of India". (U)

27. Write the contra positive of the statement:"If a triangle is equilateral, it is isosceles". (U)

28. Write the converse of thestatement: "If a number n is even, then n^2 is even". (U)

29. Write the converse of the statement: "If you do all the exercises in the book, you get an A grade in the class". (U)

30. Write the converse of thestatement: "If two integers a and b are such that $a>b$, then $a-b$ is always a positive integer". (U)

31. Write the negation of the statement: "For every real number x, $x^2>x$". (U)

32. Write the negation of the statement: "there exists a rational number x such that $x^2=2$". (U)

33. Write the negation of the statement:"All birds have wings". (U)

34. Write the negation of the statement: "All students study mathematics at the elementary level". (U)

TWO MARKS QUESTIONS

1. Write the component statement of the following compound statement and check whether the compound statement is true or false:"Zero is less than every positive integer and every negative integer". (U)

2. Write the component statement of the following compound statement and check whether the compound statement is true or false:"A line is straight and extends indefinitely in both directions". (U)

3. Write the component statement of the following compound statement and check whether the compound statement is true or false:"All living things have two legs and two eyes". (U)

4.Identifythe type of “or” used in the following statement and check whether the statement is

true or false:” $\sqrt{2}$ is a rational number or an irrational number”. (U)

5. Find the component statement of the following compound statement and check whether they are

true or false:” A square is a quadrilateral and its four sides equal”. (U)

6. Find the component statement of the following compound statement and check whether the

statement is true or false:”All prime numbers are either even or odd”. (U)

7. Find the component statement of the following compound statement and check whether the

statement is true or false:”A person who has taken Mathematics or Computer Science can go for MCA”. (U)

8. Find the component statement of the following compound statement and check whether the

statement is true or false:”Chandigarh is the capital of Haryana and UP”. (U)

9. Find the component statement of the following compound statement and check whether the

statement is true or false:” $\sqrt{2}$ is a rational number or an irrational number”. (U)

10. Find the component statement of the following compound statement and check whether the

statement is true or false:” 24 is a multiple of 2, 4, 8”. (U)

11. Find the component statement of the following compound statement and check whether the

statement is true or false:”Number 3 is primeor it is cold”. (U)

12. Find the component statement of the following compound statement and check whether the

statement is true or false:”All integers are positive or negative”. (U)

13. Find the component statement of the following compound statement and check whether the

statement is true or false:” 100 is divisible by 3, 11, 5”. (U)

14. Are the following pairs of statements negations of each other: The number x is not a rational number;

Thenumber x is not an irrational number. (U)

15. Are the following pairs of statements negations of each other: The number x is a rational number;

the number x is an irrational number. (U)

16. Write the negation of the statement:"Australia is a continent" and check whether the resulting statement is true or false. (A)

17.Write the negation of the statement:"There does not exist a quadrilateral which has all its sides equal" and check whether the resulting statement is true or false. (A)

18. Write the negation of the statement:"Every natural number is greater than 0" and check whether the resulting statement is true or false. (A)

19. Write the negation of the statement:"The sum of 3 and 4 is 9" and check whether the resulting statement is true or false. (A)

20.State whether 'or' used in the statement:"Sun rises or moon sets" is exclusive or inclusive. Give reason for your answer. (U)

21. State whether 'Or' used in the statement:"To enter a country, you need a passport or a voter registration card" is exclusive or inclusive. Give reason for your answer. (U)

22. State whether 'Or' used in the statement:" To apply for a driving license, you should have a ration card or apassport " is exclusive or inclusive. Give reason for your answer. (U)

23. State whether 'or' used in the statement:"The school is closed if it is a holiday or a Sunday" is exclusive or inclusive. Give reason for your answer. (U)

24. State whether 'or' used in the statement:"All integers are positive or negative" is exclusive or inclusive. Give reason for your answer. (U)

25. State whether 'or' used in the statement:"Two linesintersect at a point or are parallel" is exclusive or inclusive. Give reason for your answer. (U)

26. State whether 'or' used in the statement:"Students can take French or Sanskrit as their third language" is exclusive or inclusive. Give reason for your answer. (U)

27.Identify the type of "or" used in the following statement and check whether the statement is true or false:”To enter into a public library children need an identity card from the school or a letter from the school authorities”. (U)

28 In the following Compound statement first identify the connecting word and then break it into component statement:” All rational numbers are real and all real numbers are not complex” (U)

29. In the following Compound statement first identify the connecting word and then break it into component statement: ” Square of an integer is positive or negative” (U)

30. In the following Compound statement first identify the connecting word and then break it into component statement:” The sand heats up quickly in the Sun and does not cool down fast at night ” (U)

31. In the following Compound statement first identify the connecting word and then break it into component statement:”x=2 and x=3 are the roots of the equation $3x^2$-x-10=0” (U)

32. Identify the quantifier in the given statement and write the negation of the statement: ”There exists a number which is equal to its square”. (U)

33. Identify the quantifier in the given statement and write the negation of the statement: ”For every real number x,x is less than x+1 ”. (U)

34. Identify the quantifier in the given statement and write the negation of the statement:” There exists a capital for every state in India”. (U)

35. Check whether given pair of statements are negation of each other. Give reasons for your answer.

i) x + y = y + x is true for every real numbers x and y.

ii) “Thereexists real numbers x and y for which x+y=y+x” (A)

36. Write the converse and contra positive of “If x is a prime number, then x is odd” (U)

37. Write the converse and contra positive of “If the two lines are parallel, then they do not intersect in the same plane.” (U)

38.Write the converse and contra positive of “Something is cold implies that it has low temperature.” (U)

39. Write the converse and contra positive of “You cannot comprehend geometry if you do not know how to reason deductively.” (U)

40 .Write the converse and contra positive of “If a number is divisible by 9, then it is divisible by 3.” (U)

41. Write the converse and contra positive of “If you are born in India, then you are a citizen of India.” (U)

42. Write the converse and contra positive of “If triangle is equilateral, then it is isosceles.” (U)

43. Write the converse and contra positive of “If a number n is even, then n^2 is even.” (U)

44. Write the converse and contra positive of “If you do all the exercises in the book you get an A grade in the class.” (U)

45. Write the following statement in the form ‘if-then’:

”you get a job implies that your credentials are good.” (U)

46. Write the following statement in the form ‘if-then’:

”The banana trees will bloom if it stays warm for a month.” (U)

47. Write the following statement in the form ‘if-then’:

”A quadrilateral is a parallelogram if its diagonals bisect each other.” (U)

48. Write the following statement in the form ‘if-then’:” To get an A^+ in the class, it is necessary that you do all the exercise of the book”. (U)

49. Check Whether “Or” used in the following compound statement is exclusive or inclusive? Write the component statements of the compound statements and use them to check whether the compound statement is true or not. Justify your answer. “You are wet when it rains or you are in a river.” (A)

THREE MARKS QUESTION.

1. Verify by the method of contradiction: p: $\sqrt{7}$ is irrational (S)

2. Check whether the following statement is true or not. If $x, y \in \mathbb{Z}$, are such that x and y are odd, then xy is odd. (S)

3. Check whether the following statement is true or false by proving its contra positive, If $x, y \in \mathbb{Z}$,

such that xy is odd, then both x and y are odd. (S)

4. By giving a counter example, show that the following statement is false. If n is an odd integer, then n is prime. (S)

5. Show that the statement: p:If x is a real number such that $x^3+4x=0$ then x is 0" is true by direct method. (S)

6. Show that the statement: p:If x is a real number such that $x^3+4x=0$ then x is 0" is true by

method contradiction. (S)

7. Show that the statement: p:If x is a real number such that $x^3+4x=0$ then x is 0" is true by

method of contra positive. (S)

8. Show that the statement "For any real numbers a and b, $a^2=b^2$, implies that a=b" is not true

by giving a counter example. (S)

9. Show that the following statement is true by method of contra positive "If x is an integer and x^2 is even,

then x is also even" (S)

10. By giving a counter example, show that the following statement is not true:"

If all the angles of a triangle are equal, then it is an obtuse angled triangle". (S)

11.By giving a counter example, show that the following statement is not true

" The equation $x^2-1=0$ does not have a root lying between 0 and 2". (S)

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CHAPTER -15

STATSTICS

TWO MARKS QUESTION:

1. Write the mean of the given data: 6, 7, 10, 12, 13, 4, 8, 12. (U)

2. Write the mean of the given data: 4, 7, 8, 9, 10, 12, 13, 17. (U)

3. Write the mean of the given data: 38,70,48,40,42,55,63,46,54,44. (U)

4. Compute the variance and Standard deviation of the following observations of marks of 5 students. Class: marks out of 25: 8, 12, 13, 15, 22. (U)

5. Co-efficient of variation and the standard deviation of certain distribution is 60 and 21 respectively. Find the arithmetic mean of the arithmetic mean. (A)

6. Find the variance of 6, 8, 10, 12, 14. (U)

7. The standard deviation of certain data is 4. Find the variance. (U)

8. The mean of 200 scores is 48 and their standard deviation n is 3. Find the sum and sum of the squares of scores. (A)

9. Find the variance and standard deviation of the five observations: 11, 14,15,17,18. (U)

10. Find the mean and variance for the following data: 2, 4,5,6,7,8,17. (U)

11. Find the mean and variance for the following data:6,8,10,12,14,16,18,20,22,24. (U)

12. The scores of a batsmen in 10 matches are 38,70,48,34,42,55,63,46,54,44. Find standard deviation and variance. (A)

13. The mean and variance of heights of XI students are 162.6cm and 127.69cm^2 respectively. Find the coefficient of variation. (A)

14. Two series A and B with equal means have standard deviation 9 and 10 respectively. Which series is more consistent? (S)

15. Find the mean and variance for the following data: 6, 7, 10, 12, 13, 4, 8, 12. (U)

16 .Find the mean deviation about the mean for the following data:6,7,10,12,13,4,8,12. (U)

17. Find the mean deviation about the mean for the following data:12,3,18,17,4,9,17,19,20,15,8,17,2,3,16,11,3,1,0.5. (U)

18. Find the mean deviation about the mean for the following data:4,7,8,9,10,12,13,17. (U)

19. Find the mean deviation about the mean for the following data:38,70,48,40,42,55,63,46,54,44. (U)

FIVE MARKS QUESTION:

1. Find the mean deviation about the median for the following data:13,17,16,14,11,13,10,16,11,18,12,17. (U)

2. Find the mean deviation about the median for the following data:36,72,46,60,45,53,46,51,49. (U)

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

4. Find the mean deviation about the mean for the following data: *(U)*

x_i	2	5	6	8	10	12
f_i	2	8	10	7	8	5

5. Find the mean deviation about the median for the following data: (A)

x_i	3	6	9	12	13	15	21	22
f_i	3	4	5	2	4	5	4	3
c.f	3	7	12	14	18	23	27	30

6. Find the mean deviation about the mean for the following data: (A)

Marks obtainined	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Number of students	2	3	8	14	8	3	2

7. Calculate the mean deviation about median for the following data: (A)

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

8. *Find the mean deviation about the mean for the following data:* *(A)*

x_i	5	10	15	20	25
f_i	7	4	6	3	5

9. *Find the mean deviation about the mean for the following data:* *(A)*

x_i	10	30	50	70	90
f_i	4	24	28	16	8

10. *Find the mean deviation about the median for the following data:* *(A)*

x_i	5	7	9	10	12	15
f_i	8	6	2	2	2	6

11. Find the mean deviation about the mean for the following data: (A)

Marks obtainined	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Number of students	2	3	8	14	8	3	2

12. *Find the mean deviation about the median for the following data:* *(A)*

x_i	*15*	*21*	*27*	*30*	*35*
f_i	*3*	*5*	*6*	*7*	*8*

13. Find the mean deviation about the mean for the following data: (A)

Income per day	0-100	100-200	200-300	300-400	400-500	500-600	600-700	700-800
No.of persons	4	8	9	10	7	5	4	3

14. Find the mean deviation about the mean for the following data: (A)

Height in cms	95-105	105-115	115-125	125-135	135-145	145-155
Number of boys	9	13	26	30	12	10

15. Find the mean deviation about the median for the following data: (A)

Marks	0-10	10-20	20-30	30-40	40-50	50-60
No.of Girls	6	8	14	16	4	2

16. Calculate the mean deviation about median age for the age distribution of 100 persons given be Find the mean deviation about the mean for the following data: (A)

Age	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55
Number	5	6	12	14	26	12	16	9

17. Find the variance and standard deviation for the following data: (A)

x_i	*4*	*8*	*11*	*17*	*20*	*24*	*32*
f_i	*3*	*5*	*9*	*5*	*4*	*3*	*1*

18. Calculate the mean, variance and standard deviation for the following distribution: (A)

Class	30-40	40-50	50-60	60-70	70-80	80-90	90-100
Frequency	3	7	12	15	8	3	2

19. Find the Variance of the following data: 6, 8, 10, 12, 14, 16, 18, 20, 22, 24 (A)

20. Find the standard deviation for the following data: (A)

x_i	3	8	13	18	23
f_i	7	10	15	10	6

21. Find the mean and variance for First n natural numbers. (S)

22. Find the mean and variance for first 10 multiples of 3. (A)

23. Find the mean and variance for the following data: (A)

x_i	6	10	14	18	24	28	30
f_i	2	4	7	12	8	4	3

24. Find the mean and variance for the following data: (A)

x_i	92	93	97	98	102	104	109
f_i	3	2	3	2	6	3	3

25. Find the mean and standard deviation using short-cut method: (A)

x_i	60	61	62	63	64	65	66	67	68
f_i	2	1	12	29	25	12	10	4	5

26. Calculate the mean, variance and standard using short-cut method : (A)

Class	30-40	40-50	50-60	60-70	70-80	80-90	90-100
Frequency	3	7	12	15	8	3	2

27. Find the mean, variance for the following frequency distributions : (A)

Class	0-30	30-60	60-90	90-120	120-150	150-180	180-210
Frequency	2	3	5	10	3	5	2

28. Find the mean, variance for the following frequency distributions : (A)

Class	0-10	10-20	20-30	30-40	40-50
Frequency	5	8	15	16	6

29. Find the mean, Variance and standard deviation using short-cut method: (A)

Height in cms	*70-75*	*75-80*	*80-85*	*85-90*	*90-95*	*95-100*	*100-105*	*105-110*	*110-115*
Number of boys	*3*	*4*	*7*	*7*	*15*	*9*	*6*	*6*	*3*

0. The diameters of circles (in mm) drawn in a design are given below: (A)

Diameters	*33-36*	*37-40*	*41-44*	*45-48*	*49-52*
No.of circles	*15*	*17*	*21*	*22*	*25*

Calculate the standard deviation and mean diameter of the circles.

31. Two plants A and B of a factory show following results about the number of workers and the wages paid to them.

	A	B
No. of workers	5000	6**000**
Average monthly wages	Rs.2500	Rs.2500
Variance of distribution of wages	81	100

Which plant, A or B is there greater variability in individual wages? (A)

32. The following values are calculated in respect of heights and weights of the students of a section of class XI:

	Height	Weight
Mean	162.6cm	52.36kg
Variance	$127.69cm^2$	$23.1361kg^2$

Can we say that the weights show greater variation than the heights? (A)

33. From the data given below state which group is more variable, A or B? (A)

Marks	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Group A	9	17	32	33	40	10	9
Group B	10	20	30	25	43	15	7

34. From the prices of shares X and Y below, find out which is more stable in value: (A)

X	35	54	52	53	56	58	52	50	51	49
Y	108	107	105	105	106	107	104	103	104	101

35. An analysis of monthly wages paid to workers in two firms A and B, belonging to the same industry, gives the following results: (A)

	Firm A	Firm B
No.of wages earners	586	648
Mean of monthly wages	Rs.5253	Rs.5253
Variance of the distribution of wages	100	121

(i)Which firm A or B pays larger amount as monthly wages? (ii) Which firm, A or B, shows greater variability in individual wages?

36. The following is the record of goals scored by team A in football session:

No.of goals scored	0	1	2	3	4
No.of matches	1	9	7	5	3

From the team B, mean number of goals scored per match was 2 with a standard deviation 1.25 goals.

Find which team may be considered more consistent? (A)

37. The sum and sum of squares corresponding to length x (in cm) and weight y (ingm) of 50 plant products are given below:I $\sum_{i=1}^{50} x_i = 212,\ \sum_{i=1}^{50} x^2{}_i = 902.8,\ \sum_{i=1}^{50} y_i = 261,\ \sum_{i=1}^{50} y^2{}_i = 1457.6$ Which is more varying, the length or weight? (S)

38. The variance of 20 observations is 5. If each observation is multiplied by 2, find the new variance of the resulting observations. (A)

39. The mean 5 observations is 4.4 and their variance is 8.24. If three of observations are 1,2 and 6, find the other two observations. (A)

40. If each of the observation $x_1, x_2, ...x_n$ is increased by 'a', where a is a negative or positive number, show that the variance remains unchanged. (S)

41. The mean and standard deviation of 100 observations were calculated as 40 and 5.1, respectively by a student who took by mistake 50 instead of 40 for one observation. What are the correct mean and standard deviation? (A)

42. The mean and variance of eight observations are 9 and 9.25, respectively. If six of the observations are 6, 7, 10, 12, 12 and 13, find the remaining two observations. (A)

43. The mean and variance of 7 observations are 8 and 16, respectively. If five of the observations are 2, 4, 10, 12, 14. Find the remaining two observations. (A)

44. The mean and standard deviation of six observations are 8 and 4, respectively. If each observation is multiplied by 3, find the new mean and new standard deviation of the resulting observations. (S)

45. Given that $\bar{x}$ is the mean and σ^2 is the variance of n observations $x_1, x_2, ...x_n$. Prove that the mean and variance of the observations $ax_1, ax_2, ...ax_n$ are $a\bar{x}$ and $a^2\sigma^2$, respectively, ($a \neq 0$). (S)

46. The mean and standard deviation of 20 observations are found to be 10 and 2, respectively. On rechecking, it was found that an observation 8 was incorrect. Calculate the correct mean and standard deviation in each of the following cases. (i) If wrong item is omitted.
(ii) If it is replaced by 12. (S)

47. The mean and standard deviation of marks obtained by 50 students of a class in three subjects, Mathematics, physics and chemistry are given below:

Subject	Mathematics	Physics	Chemistry
Mean	42	32	40.9
Standard deviation	12	15	20

Which of the three subjects shows the highest variability in marks and which shows the lowest (A)

48. The mean and standard deviation of a group of 100 observations were found to be 20 and 3, respectively. Later on it was found that three observations were incorrect, which were recorded as 21, 21 and 18. Find the mean and standard deviation if the incorrect observations are omitted.
(A)

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CHAPTER-16

Probability

1 Mark questions

1. Define a random experiment. **(K)**

2. Define sample space of a random experiment. **(K)**

3. Write the sample space for the random experiment, “tossing a coin twice”. **(K)**

4. Write the sample space for the random experiment, “tossing a coin three times”. **(K)**

5. Write the sample space for the random experiment “rolling a pair of dice once”. **(K)**

6. A coin is tossed and a die is thrown. Write the sample space for this random experiment. **(A)**

7. Write the sample space for the random experiment “a coin is tossed and then a die is rolled only in case a head is shown on the coin”. **(A)**

8. A box contains 1 red and 3 identical white balls. Two balls are drawn at random in succession without replacement. Write the sample space for this experiment. **(U)**

9. An experiment consists of recording boy-girl composition of families with two children. What is the sample space if we record, whether it is a boy or a girl in order of their births? **(U)**

10. An experiment consists of recording boy-girl composition of families with two children. What is the sample space if we record, the number of boys in the family? **(U)**

11. An experiment consists of rolling a die and then tossing a coin once, if the number on the die is a multiple of 3. Find the sample space for this experiment. **(A)**

12. Suppose 3 bulbs are selected at random from a lot. Each bulb is tested and classified as defective (D) or non-defective (N). Write the sample space for this experiment. **(U)**

13. Write the sample space for the random experiment,” A coin is tossed twice and number of heads is recorded”. **(K)**

14. A die is thrown repeatedly until a six comes up. What is the sample space for this experiment? **(A)**

15. Write the sample space for the random experiment,” A coin is tossed repeatedly until a tail comes up”. **(A)**

16. Write the sample space for the random experiment “selecting a boy and a girl from a group of 3 boys and 2 girls”. **(U)**

17. Write the sample space for the random experiment “drawing a die at random from a bag containing one red, one blue dice and rolling it once”. **(U)**

18. A coin is tossed ‘n’ times. Find the number of elements in its sample space. **(U)**

19. What is the number of sample points in the sample space of the experiment,” rolling of a pair of dice once”? **(U)**

20. A card is selected from a pack of 52 cards. How many sample points are there in the sample space? **(U)**

21.How many sample points are there in the sample space of the experiment, ”drawing two cards in succession without replacement from a pack of 52 playing cards”? **(U)**

22. A bag contains 3 non-identical black balls and 4 non-identical white balls .Two balls are drawn at random in succession. Then find the number of elements in the sample space of the experiment. **(A)**

23. Define a simple event. **(K)**

24. Define a compound event. **(K)**

25. Three coins are tossed once. State whether the event “three heads show” is a simple event or a compound event. **(U)**

26. A die is rolled once. State whether the event “getting a prime number” is a simple event or a compound event. **(U)**

27. Consider the random experiment “rolling a die once”. Write the event, “a number less than 5 appears”. **(U)**

28. A coin is tossed twice. Find the total number of events that can be associated with this experiment. **(U)**

29. What is the probability of an impossible event? **(K)**

30. What is the probability of a sure event? **(K)**

31. If P(AUB)=P(A)+P(B), then what can be said about the events A and B? **(U)**

32. If E_1 and E_2 are exhaustive events then find the probability of the event $'E_1 or E_2'$ **(A)**

33. If the probabilities of three mutually exclusive and exhaustive events A, B, C are p, 2p, 3p respectively, then find the value of p. **(A)**

34. 6 boys and 5 girls participated in a debate competition. How likely is it that the winner of the competition is a boy? **(A)**

35. Events E and F are such that P(not E or not F)=0.75. State whether E and F are mutually exclusive. **(U)**

36. If P(A)=0.5 , P(B)=0.7 and P(A∩B)=0.6 then check whether P(A) and P(B) are consistently defined. **(A)**

37.A letter is chosen at random from the word 'PROBABILITY'. Find the probability that the letter is a consonant. **(S)**

38.A letter is chosen at random from the word 'ASSASSINATION'. Find the probability that the letter is a vowel. **(S)**

39. Find the probability that in a random arrangement of the letters of the word 'QUESTION',**T** always comes at the first place. **(S)**

40. An integer is chosen at random from 1 to 20. What is the probability that the integer is a multiple of 4. **(U)**

41. What is the probability that a natural number selected at random from 1 to 10 is a prime number, if each of the ten numbers is equally likely to be selected? **(U)**

42. There are four men and six women on the city council. If one council member is selected for a committee at random, how likely is it that it is a woman? **(U)**

43. If $\frac{2}{11}$ is the probability of an event A, what is the probability of the event 'not A'? **(S)**

44. If $S=\{w_1, w_2, w_3, w_4\}$ is the sample space of an experiment, then find the value of $P(w_1)+P(w_2)+P(w_3)+P(w_4)$. **(U)**

45. If $S=\{w_1, w_2, w_3, w_4\}$ is the sample space of an experiment, then check whether the following assignment of probabilities $P(w_1)=\frac{1}{4}$, $P(w_2)=\frac{1}{3}$, $P(w_3)=\frac{1}{6}$, $P(w_4)=\frac{1}{4}$ is valid. **(U)**

46. If $S=\{w_1, w_2, w_3, w_4, w_5, w_6\}$ is the sample space of an experiment, then check whether the following assignment of probabilities $P(w_1)=0.2$, $P(w_2)=0.3$, $P(w_3)=0.1$, $P(w_4)=0.15$ $P(w_5)=2.5$ $P(w_6)=-0.3$ is valid. **(U)**

47. A book contains 60 pages. A page is chosen at random. What is the chance that the number on the page is a multiple of 10? **(U)**

48. A card is drawn from a well shuffled deck of 52 playing cards. Find the probability that the card drawn is an ace of hearts. **(S)**

49. A card is drawn from a well shuffled deck of 52 playing cards. Find the probability that the card drawn is a king of spades. **(S)**

50. A card is drawn from a well shuffled deck of 52 playing cards. Find the probability that the card drawn is a red card. **(S)**

51. A card is drawn from a well shuffled deck of 52 playing cards. Find the probability that the card drawn is a club. **(S)**

52. A card is drawn from a well shuffled deck of 52 playing cards. Find the probability that the card drawn is a Jack of diamonds or a king of clubs. **(S)**

53. A card is drawn from a well shuffled deck of 52 playing cards. Find the probability that the card drawn is an ace. **(S)**

54. A card is drawn from a well shuffled deck of 52 playing cards. Find the probability that the card drawn is a face card. **(S)**

55. A card is drawn from a well shuffled deck of 52 playing cards. Find the probability that the card drawn is not a diamond. **(S)**

56. Two cards are drawn from a well shuffled pack of 52 playing cards without replacement. Find the probability that both cards drawn are queens. **(S)**

57. Three unbiased dice are rolled once simultaneously. Find the probability that the same number appears on all the three dice. **(S)**

58. In a leap year, find the probability of 53 Sundays and 53 Mondays. **(S)**

2 Mark Questions

1. A box contains 15 identical cards and numbers 1 to 15 are written on them separately. A card is selected at random. What is the probability that the number on the card is not a multiple of 5? **(S)**
2. A letter is chosen at random from the word 'MATHEMATICS'. Find the probability that letter is a (i) vowel (ii) consonant **(S)**
3. Two letters are chosen at random from the word 'TUESDAY'. What is the probability that both the letters are vowels? **(S)**
4. A die is rolled. Let E be the event, "die shows 4" and F be the event ,"die shows even number". Write the events E and F. Check whether E and F mutually exclusive. **(S)**

5. A die is rolled. Let E be the event, “die shows a prime” and F be the event,”die shows a multiple of 3”. Write the events E and F. Check whether E and F mutually exclusive. **(S)**

6. A coin is tossed twice. Write the events, A: “at least one head appears”, B:”at most one tail appears”. Check whether they are exhaustive events. **(S)**

7. A coin is tossed thrice. Write the events,A:”no head appears”, B: “at least two head appears”. Check whether the events are mutually exclusive. **(S)**

8. Three coins are tossed simultaneously. Write the events

(i) A:”getting 3 heads”(ii)B:”getting a tail on two coins”. Are they mutually exclusive? **(S)**

9. Three coins are tossed once. Write the events A:”a tail shows on the first coin ” and B:”at least one head shows”. Check whether the events A and B are exhaustive. **(S)**

10. Three coins are tossed. Write two events which are mutually exclusive. **(U)**

11. Three coins are tossed. Write three events which are mutually exclusive and exhaustive. **(U)**

12. Three coins are tossed. Write two events which are not mutually exclusive. **(U)**

13. Three coins are tossed. Write two events which are mutually exclusive but not exhaustive. **(U)**

14. Three coins are tossed. Write three events which are mutually exclusive but not exhaustive. **(U)**

15. Consider the random experiment “rolling a die once”. Write the events, A: “an even number greater than 4 appears” and B:”a number not less than 3 appears”. Check whether they are mutually exclusive. **(S)**

16. Consider the random experiment “rolling a die once”. Write the events, A: “a prime number appears” AndB: ”an even number greater than 2 appears ”. Check whether they are mutually exclusive. **(S)**

17. A coin is tossed thrice. Find the number of sample points in the sample space. Also find the number of events that can be associated with this experiment. **(S)**

18. Consider the random experiment “rolling a die once”. Write the events, A: “a number less than 5 appears” and B: ”a multiple of 3 appears”. Check whether they are mutually exclusive. **(S)**

19. A die is rolled once and the number appearing on the uppermost face is noted. Write the events, A: “a number greater than 1 appears”, B:”a number not more than 3 appears”. Check whether the events are exhaustive. **(S)**

20. A die is thrown. Write the following events:

A:" an even number greater than 4 appears" B: "a number less than 5 appears" .
Also Write the event' A or B '. **(S)**

21. A die is thrown. Write the following events:

A: "a number less than 7 appears" B: "a multiple of 3 appears".
AlsoWritethe event ' A and B ' . **(S)**

22. A die is thrown. Write the following events: A:" a number not less than 3 appears" B: "a prime number appears". Also Write the event' A but not B '. **(S)**

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

24. Given P (A) = $\frac{2}{7}$ and P (B) = $\frac{3}{7}$. If A and B are mutually exclusive events, find P(A or B). **(U)**

25. A die is thrown.Find the probability of the event: "A prime number will appear". **(U)**

26. A die is thrown.Find the probability of the event: "An even number less than 4 will appear". **(U)**

27. A die is thrown. Find the probability of the event: "A number not less than 3 will appear". **(U)**

28. A coin is tossed twice. What is the probability that at least one tail occurs? **(S)**

29. A coin is tossed twice. What is the probability that at most one head occurs? **(S)**

30. Three coins are tossed at once. Find the probability of getting at least two heads? **(S)**

31. Two dice are thrown .Then Write the event," the sum of the numbers which come up on the dice is even". Also find the probability of the event. **(S)**

32. Two dice are thrown .Then write the event, "the sum of the numbers which come up on the dice is greater than 8". Also find the probability of the event. **(S)**

33. Two dice are thrown .Then write the event, "the sum of the numbers on the dice is less than or equal to 5". Also find the probability of the event. **(S)**

34. On her vacations Veena visits four cities A,B,C and D in random order. What is the probability that she visits A before B? **(S)**

35. On official work Sharathvisits four cities A,B,C and D in random order. What is the probability that he visits A first and B last? **(S)**

36. A salesman visits four shops P,Q, R,S on a day, in a random order .What is the probability that he visits P just before Q? **(S)**

37. The number lock of a suitcase has 4 wheels, each labelled with ten digits i.e. from 0 to 9. The lock opens with a sequence of four digits with no repeats. What is the probability of a person getting the right sequence to open the suitcase? **(S)**

38. 4 cards are drawn from a well shuffled deck of 52 cards. What is the probability of obtaining 3 diamonds and one spade? **(U)**

39. Find the probability that when a hand of 7 cards is drawn from a well shuffled deck of 52 cards, it contains 'all Kings'. **(S)**

40. Find the probability that when a hand of 7 cards is drawn from a well shuffled deck of 52 cards, it contains '3 Kings'. **(S)**

41. Three letters are dictated to three persons and an envelope is addressed to each of them, the letters are inserted into the envelopes at random so that each envelope contains exactly one letter. Find the probability that at least one letter is in its proper envelope. **(S)**

42. A and B are two events such that P(A)=0.42,P(B)=0.48 and P(A and B)=0.16. Determine

(i) P(not A) (ii)P(A or B). **(U)**

43. A and B are two events such that P(A)=0.54 ,P(B)=0.69 and P(A∩B)=0.35. Find (i) $P(A \cap B')$ (ii) $P(B \cap A')$ **(S)**

44. If P(E)=0.6 ,P(F)=0.4 and P(E∩F)=0.1 , then find P(neither E nor F). **(S)**

45. The probabilities that at least one of the events A and B occurs is 0.8. If A and B occur simultaneously with probability 0.1, then find $P(A') + P(B')$. **(S)**

46. A and B are events such that $P(A \cup B) = \frac{5}{7}$, $P(A \cap B) = \frac{1}{7}$ and $P(A') = \frac{4}{7}$ then find $P(A' \cap B)$.**(S)**

47. In a lottery, a person chose six different natural numbers at random from 1 to20,and if these six numbers match with the six numbers already fixed by the lottery committee, he wins the prize. What is the probability of winning the prize in the game?(Order of the numbers is not important). **(S)**

48. 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. **(A)**

49. A card is drawn at random from a well shuffled pack of 52 cards. Find the probability that it is either a queen or a spade. **(S)**

50. 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) a Jack **(U)**

51. 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) an ace (ii) a black card. **(U)**

52. Three numbers are chosen randomly from {1,2,3,4,5,6}. What is the probability that they are not consecutive? **(S)**

53. A fair coin is tossed four times, and a person wins Rupee.1 for each head and looses Rupees 1.50 for each tail that turns up. Find the probability that the person wins Rupees.1.50. **(A)**

54. In an entrance test that is graded on the basis of two examinations, the probability of a randomly Chosen student passing the first examination is 0.8 and the probability of passing the second examinatio is 0.7. The probability of passing at least one of them is 0.95. What is the probability of passing both? **(A)**

3 Mark Questions

1. Two students Anil and Ashima appeared in an examination. The probability that Anil will qualify the examination is 0.05 and that Ashima will qualify the examination is 0.10. The probability that both will qualify the examination is 0.02. Find the probability that both Anil andAshima will not qualify in the examination. **(A)**

2. Two friends Ramesh and Arati appeared in a competitive examination. The probability that Ramesh will qualify the examination is 0.08 and that Arati will qualify the examination is 0.15. The probability that both will qualify the examination is 0.03. Find the probability that only one of them will qualify the examination. **(A)**

3.If A and B are two events such that $P(A)=0.54$, $P(B)=0.69$ and $P(A\cap B)=0.35$ then find (i) $P(A\cup B)$ (ii) $P(A^1\cap B^1)$ **(S)**

4. If E and Fare events such that $P(E)=\frac{1}{3}$, $P(F)=\frac{1}{6}$ and $P(EandF)=\frac{1}{9}$ then find (i) $P(EorF)$ (ii) $P(notEandnotF)$. **(S)**

5. If E and Fare events such that $P(E)=\frac{1}{4}$, $P(F)=\frac{1}{2}$ and $P(E.and.F)=\frac{1}{8}$ then find (i) $P(EorF)$ (ii) $P(not.E.and.notF)$. **(S)**

6. 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 spade (ii) a red card (iii) not a King **(S)**

7. 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 heart (ii) a queen (iii) not a black card **(S)**

8. 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 (iii) not a club. **(S)**

9. Find the probability that when a hand of 7 cards is drawn from a well shuffled deck of 52 cards, it contains 'at least 3 Kings'. **(S)**

10. A committee of two persons is to be selected from 2 men and 2 women. What is the probability that the committee will have (i) no man? (ii) One man? **(A)**

11. A group of two persons is to be selected from 3 men and 2 women .what is the probability that the group will have (i) no woman? (ii) at least one woman ? **(A)**

12. A team of three persons is to be selected from 2 boys and 3 girls. What is the probability that the team will have (i) three girls (ii)at most one boy? **(A)**

13. The numbers 1 to 100 are written separately on 100 slips of paper. The slips are put in a box and mixed thoroughly. A person draws a slip from the box. What is the probability that the number written on the slip drawn is (i) even (ii) greater than 90(iii) less than or equal to 12. **(S)**

14. In a class of 60 students, 30 opted for NCC, 32 opted for NSS and 24 opted for both NCC and NSS. If one of these students is selected at random, find the probability that

(i) the student has opted for NCC or NSS (ii) the student has opted NSS but not NCC **(A)**

15. The probability that a student will pass the final examination in both English and Hindi is 0.5 and the probability of passing neither is 0.1. If the probability of passing the English examination is 0.75, what is the probability of passing the Hindi examination? **(A)**

16. 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) yellow(ii) not blue (iii) either red or blue. **(S)**

17. A box contains 10 red marbles, 20 blue marbles and 30 green marbles. 5 marbles are drawn from the box, in succession without replacement, what is the probability that (i) all will be blue? (ii)at least one will be green? **(S)**

18. A die has two faces each with number '1' , three faces each with number '2' and one face with number '3'. If die is rolled once, determine (i) P(2) (ii)P(1 or 3)(iii) P(not 3) **(S)**

19. In a certain lottery 10,000 tickets are sold and ten equal prizes are awarded. What is the probability of not getting a prize if you buy (i) one ticket? (ii) two tickets? **(S)**

20. If 4-digit numbers greater than 5,000 are randomly formed from the digits 0,1,3,5 and 7, what is the probability of forming a number divisible by 5, when the repetition of digits is not allowed? **(S)**

21. In a relay race there are five teams A,B,C,D and E. (a) What is the probability that A, B and C finish first, second and third, respectively?(b) What is the probability that A, B and C are first three to finish (in any order)? (Assume that all finishing orders are equally likely). **(A)**

22. Out of 100 students, two sections of 40 and 60 are formed. If you and your friend are among the 100 students, what is the probability that you both enter the same section? **(A)**

23. Out of 50 students, two groups of 20 and 30 are formed. If you and your friend are among the 50 students, what is the probability that you and your friend enter different groups? **(A)**

24. Three coins are tossed once; find the probability of getting (i) 2 heads(ii) at least 2 heads (iii) at most 2 tails. **(S)**

25. Three coins are tossed once; find the probability of getting (i) 3 tails (ii) at least 2 tails (iii) one head. **(S)**

26. A fair coin with 1 marked on one face and 6 on the other and a fair die are both tossed. Find the probability that the sum of numbers that turn up is (i) 3 (ii) 12 **(S)**

27. A fair coin with 3 marked on one face and 5 on the other and a fair die are both tossed. Find the probability that the sum of numbers that turn up is (i) 6 (ii) 11 **(S)**

28. Two dice are thrown. Write the following events.

A: getting an even number on the first die

B: getting the sum of the numbers on the dice ≤ 5.

Also Write the event "Abut not B **"**. **(S)**

29. Two dice are thrown simultaneously and numbers on their uppermost faces are noted. Write the events, A:"getting a total of more than 5 but less than 10", B:"getting a total of 12". Also find the probability of the event "A or B". **(S)**

30. A die is rolled twice. Write the following events. A:"getting the sum of the numbers on the die in two throws is ≥ 9". B:"getting an even number on the first throw and a multiple of 3 on the second throw". Also find the probability of the event "A and B". **(S)**

31. If A, B, C are three events associated with a random experiment, prove that
$P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap B) - P(B \cap C) - P(A \cap C) + P(A \cap B \cap C)$ **(S)**

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