DISCRETE MATHEMATICS MCQ

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PREFACE

This MCQ textbook is an initiative by the **Department of Mathematics, St. Joseph's College of Arts and Science for Women, Hosur**. It was thought the preparation of MCQ textbooks for Mathematics with the following objectives:

1. Uniformizing notations, and definitions
2. Focusing on important aspects of the syllabus that must be understood.
3. Collecting all relevant topics, problems, and hints prescribed in the syllabus.
4. Providing a complementary application idea to the freshers(staff) and students.

The book is prepared according to the syllabus of Periyar University of 2021 onwards syllabus, with a list of reputed books in the subject recommended for reference. The syllabus deals with two important topics in Mathematics, Logic, Normal forms, Counting (Combinatorics), Relations, and Boolean Algebra. A proper understanding of all the topics would go a long way in making the MCQ fully applicable. The authors have given a suggested list of practical problems to cover different types of topics. It is based on chapters of the book "Discrete Mathematics and its Applications" by Kenneth H. Rosen and J.p. Tremblay, R. Manohar.

SYLLABUS

ELECTIVE COURSE – I– DISCRETE MATHEMATICS

UNIT – I

Mathematical logic – Statements and Notations – Connectives – Negation – Conjunction – Disjunction – Statement formulas and truth table – Conditional and Bi conditional – Well formed formulas – Tautologies. Chapter 1(sections 1.1, 1.2.1 to 1.2.4, 1.2.6 to 1.2.8)

UNIT – II

Normal forms – Disjunctive Normal forms – Conjunctive Normal forms – Principal Disjunctive Normal forms – Principal conjunctive Normal forms - Ordering and uniqueness of normal forms – Validity using truth tables – Rules of inference. Chapter 1(sections 1.3.1 to 1.3.5, 1.4.1, 1.4.2)

UNIT – III

Relations and Ordering – Relations – Properties of Binary binary relations in a set – Partial Ordering – Partially ordered set: Representation and Associated terminology – Functions: Definition and Introduction – Composition of functions – Inverse functions – Natural numbers: Peano axioms and Mathematical induction. Chapter 2 (sections 2.3.1, 2.3.2, 2.3.8, 2.3.9, 2.4.1 to 2.4.3, 2.5.1)

UNIT – IV

Algebraic systems: Definition and examples - Semigroups and Monoids: Definition and examples – Homomorphism of Semigroups and Monoids – Subsemigroups and Submonoids. Chapter 3 (sections 3.1.1, 3.2.1, 3.2.2 and 3.2.3)

UNIT – V

Lattices as partially ordered sets: Definition and examples – Some properties of Lattices – Sub lattices, Direct product and Homomorphism – Boolean algebra: Definition and examples – Sub Algebra, Direct product and Homomorphism. Chapter 4 (sections 4.1.1, 4.1.2, 4.1.4, 4.2.1, 4.2.2)

TEXT BOOK:

1. J.P. Tremblay, R. Manohar, Discrete Mathematical structure with Applications to computer science, Tata Mc Graw hill, 2001.

REFERENCE BOOKS:

1. Dr.M.K. Sen and Dr. B.C. Charraborthy, Introduction to Discrete Mathematics, Arunabha Sen Books & allied Pvt.Ltd, 8/1, Chintamoni Das Lane, Kolkatta – 700 009.

DISCRETE MATHEMATICS – MCQ

1. If x is a set and the set contains an integer which is neither positive nor negative then the set x is _____.
   a. Set is Empty b. Set is non-empty
   c. Set is Finite. d. Set is both Non- empty and Finite.

2. If x ∈ N and x is prime, then x is _____ set.
   a. Infinite set b. Finite set
   c. Empty set d. Not a set

3. If x is a set and the set contains the real number between 1 and 2, then the set is _____.
   a. Empty set b. Finite set
   c. Infinite set d. None of the mentioned

4. Which of the following is a subset of set {1, 2, 3, 4}?
   a. {1, 2} b. {1, 2, 3}
   c. {1} d. All of the mentioned

5. Convert the set x in roster form if set x contains the positive prime number, which divides 72.
   a. {∅} b. {2, 3}
   c. {2, 3, 7} d. {3, 5, 7}

6. Power set of empty or Null set has exactly _____ subset.
   a. One b. Two
   c. Zero d. Three

7. What is the Cartesian product of set A and set B, if the set A = {1, 2} and set B = {a, b}?
   a. { (1, a), (1, b), (2, a), (b, b) }
   b. { (1, 1), (2, 2), (a, a), (b, b) }
   c. { (1, a), (2, a), (1, b), (2, b) }
   d. { (1, 1), (a, a), (2, a), (1, b) }

8. The members of the set S = {x | x is the square of an integer and x < 100} is _____
   a. {0, 2, 4, 5, 9, 55, 46, 49, 99, 81}
   b. {1, 4, 9, 16}
   c. {0, 1, 4, 9, 16, 25, 36, 49, 64, 81}
   d. {0, 1, 4, 9, 25, 36, 49, 123}

9. The intersection of the sets {1, 2, 8, 9, 10, 5} and {1, 2, 6, 10, 12, 15} is the set _____
   a. {1, 2, 10}
   b. {5, 6, 12, 15}
   c. {2, 5, 10, 9}
   d. {1, 6, 12, 9, 8}

10. The difference of {1, 2, 3, 6, 8} and {1, 2, 5, 6} is the set _____
   a. {1, 3}
   b. {5, 6, 8}
   c. {3, 8}
   d. {2, 6, 5}

11. If n(A) = 20 and n(B) = 30 and n(A U B) = 40 then n(A ∩ B) is?
   a. 20
   b. 30
   c. 40
   d. 10

12. Let the players who play cricket be 12, the ones who play football 10, those who play only cricket are 6, then the number of players who play only football are _____, assuming there is a total of 16 players.

a. 16 b. 8
c. 4 d. 10

13. Which among the following can be taken as the discrete object?

a. People b. Rational numbers
c. Integers d. All of the mentioned

14. Which option contains two equal sets?

a. X = {5, 6} and Y = {6}
b. X = {5, 6, 8, 9} and Y = {6, 8, 5, 9}
c. X = {5, 6, 9} and Y = {5, 6}
d. X = {5, 6} and Y = {5, 6, 3}

15. The cardinality of the Power set of the set {1, 5, 6} is_____.

a. 5 b. 6
c. 8 d. 10

16. The Cartesian product of the (Set Y) x (Set X) is equal to the Cartesian product of (Set X) x (Set Y) or Not?

a. Yes b. No
c. None of the above d. I Don't know

17. How many elements in the Power set of set A= {{Φ}, {Φ, {Φ}}}?

a. 4 elements b. 2 elements

c. 6 elements d. 5 elements

18. Mathematics can be broadly categorized into how many types?

a. 3 types b. 2 types
c. 5 types d. 4 types

19. Which of the following function is not a mathematics function?

a. many to one b. one-to-many
c. one to one d. All of the mentioned

20. Which of the following function is also referred to as an injective function?

a. Many-to-one b. Onto
c. One-to-One d. None of the mentioned

21. How many injections are defined from set A to set B if set A has 4 elements and set B has 5 elements?

a. 24 b. 64
c. 144 d. 120

22. The function (gof) is _____ , if the function f and g are onto function?

a. Into function b. one to one function
c. onto function d. one-to-many function

23. How many bytes are needed for encoding 2000 bits of data?

a. 5 Byte b. 2 bytes
c. 4 bytes d. 8 bytes

24. The cardinality of the set of even positive integers less than 20 is_____?

a. 8 b. 10
c. 9 d. 12

25. If X = {2, 8, 12, 15, 16} and Y= {8, 16, 15, 18, 9} then union of X and Y is_____.

a. {2, 8, 12, 15, 16}
b. { 8, 16, 15}
c. {8, 16, 15, 18, 9}
d. {2, 8, 9, 12, 15, 16, 18}

26. What is Floor function?

a. It maps the real number to the greatest previous integer
b. It maps the real number to the smallest previous integer
c. It maps the real number to the smallest following integer
d. None of the mentioned

27. What is Ceil function?

a. It maps the real number to the greatest previous integer
b. It maps the real number to the smallest previous integer
c. It maps the real number to the smallest following integer
d. None of the mentioned

28. What is the value of Floor(8.4) + Ceil(9.9)?

a. 18 b. 19
c. 20 d. 17

29. If a and b are two positive numbers that are less than one, then the maximum value of Floor(a+b) and Ceil(a+b) is?

a. Floor(a+b) is 0 and Ceil(a+b) is 1.
b. Floor(a+b) is 1 and Ceil(a+b) is 0.
c. Floor(a+b) is 1 and Ceil(a+b) is 2.
d. Floor(a+b) is 2 and Ceil(a+b) is 1

30. How many relations exist from set X to set Y if the set X and set Y has 7 and 8 elements?

a. 2^{56} b. 2^{72}
c. 3^{56} d. 56

31. The number of reflexive closures of the relation {(0,1), (1,1), (1,3), (2,1), (2,2), (3,0)} on the set {0, 1, 2, 3} is_____.

a. 36 b. 8
c. 6 d. 2^6

32. The number of transitive closures exists in the relation R = {(0,1), (1,2), (2,2), (3,4), (5,3), (5,4)} where {1, 2, 3, 4, 5} ∈ A is_____.

a. {(0,1), (0,2), (1,2), (2,2), (3,4), (5,3), (5,4)}
b. {(0,0), (4,4), (5,5), (1,1), (2,2), (3,3)}
c. {(0,1), (1,2), (2,2), (3,4)}
d. {(0,1), (5,3), (5,4), (1,1), (2,2)}

33. Which statement is incorrect if X and Y are the two non-empty relations on the set S.

a. If X and Y are transitive, then the intersection of X and Y is also transitive.

b. If X and Y are reflexive, then the intersection of X and Y is also reflexive.
c. If X and Y are symmetric, then the union of X and Y is not symmetric.
d. If X and Y are transitive, then the union of X and Y is not transitive.

34. Which option is the negation of the bits "1001011"?

a. 11011011 b. 10110100
c. 0110100 d. 1100100

35. What is the output of X (Ex-or) Y, if the bits of X is 001101 and the bits of Y is 100110?

a. Output of X (Ex-or) Y is 101011
b. Output of X (Ex-or) Y is 1101010
c. Output of X (Ex-or) Y is 101000
d. Output of X (Ex-or) Y is 0010101

36. Boolean algebra deals with how many values.

a. It deals with only four discrete values.
b. It deals with only five discrete values.
c. It deals with only three discrete values.
d. It deals with only two discrete values.

37. Which of the following Law of Boolean proofs the X.X=X?

a. Identity Law b. Double Complement Law
c. Complement Law d. Idempotent Law

38. According to the symmetric matrix, which of the following statement is correct?

a. $A = A^T$
b. All the diagonal elements of a symmetric matrix are One.
c. $A = -A^T$
d. All the diagonal elements of a symmetric matrix are Zero.

39. Which of the following matrix having only one row and multiple columns?

a. Diagonal Matrix b. Row Matrix
c. Column Matrix d. None of the mentioned

40. Which of the following matrix having only one column and multiple rows?

a. Diagonal Matrix b. Row Matrix
c. Column Matrix d. None of the mentioned

41. Which of the following condition is correct if we want to add two matrices?

a. Both rows and columns of both the matrices which we want to add are the same
b. Columns of both the matrices which we want to add are equal
c. Rows of both the matrices which we want to add are the same
d. a number of the first matrix's rows should be equal to the number of the second matrix's column, which we want to add.

42. A+B = B+A is a true or false statement if the order of A matrix and B matrix is the same.

a. False b. True
c. Neither true nor false d. 0

43. XY = YX is a true or false statement if the order of A matrix and B matrix is the same.

a. False b. True
c. 1 d. 0'

44. Universal logic gate is_____.

a. OR b. NOT
c. NAND d. AND

45. In which year Maurice Karnaughin introduced the Karnaugh map?

a. 1953 b. 1956
c. 1952 d. 1950

46. Canonical forms for a boolean expression has _____ types.

a. Three types b. Four types
c. Two types d. Five types

47. The use of Boolean algebra is _____.

a. in building the algebraic functions.
b. in building logic symbols.
c. in circuit theory.
d. in designing the digital computers.

48. Boolean algebra deals with how many values.

a. It deals with only four discrete values.

b. It deals with only five discrete values.
c. It deals with only three discrete values.
d. It deals with only two discrete values.

49. Which search compares each element with the searching element till not found?

a. Merge search
b. Sequential Search
c. Binary search
d. none of the mentioned

50. If a user wants to sort the unsorted list of n elements, then the insertion sort starts with which element of the list.

a. First element of the list
b. the second element of the list
c. the Third element of the list
d. the Fourth element of the list

51. What is the complexity of the bubble sort algorithm?

a. O (n^2)
b. O (n)
c. O (log n)
d. O(n log n)

52. What is the worst case of a linear search algorithm?

a. When the searching item is present in the middle of the list.
b. When the searching item is the last element in the list.
c. When the searching is not available in the list.
d. When the searching item is the last element in the list or is not present in the list.

53. Which algorithm uses the previous outputs for finding the new outputs?

a. Dynamic Programming algorithms
b. Divide and Conquer algorithm
c. Brute Force algorithm
d. None of them

54. Which option is correct for representing an algorithm?
a. Pseudo codes
b. Flow charts
c. Statements in the common language
d. All of them

55. Which case does not exist in complexity theory?
a. Average case b. Null case
c. Best case d. Worst Case

56. Which one of the following is a proposition?
a. How are you? b. What time is it?
c. 4 + `x` = 5 d. India is in Europe.

57. What is the negation of the statement "Salman sent more than 100 text messages every day"?
a. Salman sent more than 200 text messages every
b. Salman sent less than 100 text messages but not every day.
c. Salman did not send more than 100 text messages every day.
d. Salman did not send any text message every day.

58. Select the appropriate option after evaluating following four biconditionals are true or false.

1) 2 + 2 = 4 if and only if 1 + 1 = 2. 2) 1 + 1 = 2 if and only if 2 + 3 = 4. 3) 1 + 1 = 3 if and only if fishes can fly. 4) 0 > 1 if and only if 2 > 1.

a. Only 1 and 3 are True
b. Only option 3 and 4 are True
c. Option 1 is True
d. All options are false

59. What will be Truth values of the statement `$p \leftrightarrow \neg p$` for the Truth values T, F of p?

a. T, F b. F, T
c. T, T d. F,F

60. What will be Truth values of the statement $(p \wedge q) \rightarrow (p \vee q)$ for the Truth values T,T,F,F of p and T,F,T,F of q?

a. T, F,T,F b. F, T,F,T
c. T, T,T,T d. F,F,F,F

61. If `p`: "You can use the wireless network in the airport," `q`: "You pay the daily fee," and `r`: "You are a subscriber to the service". Which is the right expression for the statement "To use the wireless network in the airport you must pay the daily fee unless you are a subscriber to the service".

a. `$p \wedge r \rightarrow p$` b. `$q \vee r \rightarrow p$`
c. `$p \wedge (q \vee r)$` d. `$p \wedge (q \wedge r)$`

62. What is the negation of the statement "Sam is rich and happy"?

a. Sam is poor and unhappy.
b. Either Sam is poor or happy
c. Either Sam is poor or unhappy

d. Sam is not rich and happy.

63. Let Q(x, y) denote the statement "y is the capital of x." What are these truth values? i) Q(Punjab, Chandigarh), ii) Q(India, New Delhi) iii) Q(Rajasthan, Shimla), iv) Q(Nepal, Kathmandu)

a. T,F,T,F b. T,T,F,F
c. T,T,F,T d. T,T,T,T

64. `(¬q ∧ (p → q)) → ¬p` is a

a. Contingency b. Tautology
c. Contradiction d. None of these

65. (p → q) ∧ (p → r)` is logically equivalent to

a. `p → (q ∨ r)` b. `p → (q ∧ r)`
c. `p ∧ (q → r)` d. `p ∧ (q → r)`

66. `¬p ↔ ¬q is logically equivalent to

a. `p → (q ∨ r)` b. `p → (q ∧ r)`
c. `p ∧ (q → r)` d. `p ∧ ¬(q → r)`

67. `¬p ↔ q` is logically equivalent to `p ↔ ¬q`

a. p ↔ ¬q` b. `p ↔ q`
c. `p ∧ ¬q d. `p ∨ ¬q`

68. `(p → q) ∧ (q → r) → (p → r)` is a

a. Contingency b. Contradiction
c. Tautology d. All the above are true

69. If x and y are integers of opposite parity (one odd another even) the 5x+5y is

a. Always Odd

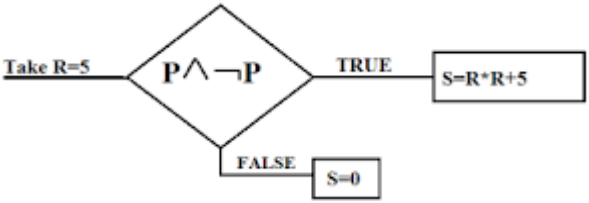
b. Always Even
c. Odd for some values and even for other values
d. Can not be decided

70. `¬(∀x ∈ A)p(x)`is logically equivalent to
a. `(∃ x ∈ A)¬p(x)` b. `(∃ x ∈ ¬A)p(x)`
c. `(∀ x ∈ ¬A)p(x)` d. `(∀ x ∈ A)¬p(x)`

71. Contrapositive of the statement "If you are honest, then you are respected."
a. If You are honest then he is not respected.
b. If You are not respected than you are not honest.
c. If you are not honest then you are not respected.
d. If you are respected then you are honest.

72. Contrapositive of the statement "If Sahir is a poet, then he is poor"
a. If Sahir is rich then he is not poet
b. If Sahir is not a poet then he is not poor
c. If Sahir is not poor then he is a poet
d. If Sahir is not a poet then he is not poor

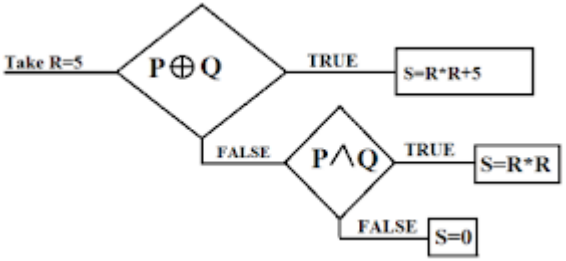
73. Let P: Dogs can fly And consider the following flow chart of a computer program Then the value of S is



a. 30 b. 20

c. 0 d. 10

74. Let P: 5+10=15, Q: 5*10=50 And consider the following flow chart of a computer program Then the value of S is



a. 30 b. 25
c. 0 d. 10

75. What is the correct translation of the following statement into mathematical logic? “Some COVID 19 vaccines have complete the last trial are ready for production” where: COVID-19 vaccine, has completed the last trial, is ready for production.

a. `∃x (t(x) ∨ p(x))` b. `∃x (t(x) → p(x))`
c. `∃x (t(x) ∧ p(x))` d. `∃x (p(x) → t(x))`

76. Consider the following statements over the set of integers
P: k is even Q: `3k+1` is odd
Then which of the following is/are true

a. Only converse for the proposition is true
b. Only inverse for the proposition is true
c. Both converse and inverse for the proposition is true
d. Neither converse nor inverse for the proposition is true

77. Which of the following statements is the contrapositive of the statement, "You win the game if you know the rules but are not over confident?"

a. If you lose the game then you don't know the rules or you are overconfident

b. A sufficient condition that you win the game is that you know the rules or you are not overconfident

c. If you don't know the rules or are overconfident you lose the game

d. If you know the rules and are overconfident then you win the game

78. In proving `π` as irrational, we begin with assumption `√7` is rational in which type of proof?

a. Direct proof b. Proof by Contradiction

c. Vacuous proof d. Mathematical Induction

79. Which of the following can only be used in disproving the statements?

a. Direct proof b. Contrapositive proofs

c. Counter Example d. Mathematical Induction

80. Let P: We should be honest., Q: We should be dedicated., R: We should be overconfident. Then 'We should be honest or dedicated but not overconfident.' is best represented by?

a. `¬P V ¬Q V R` b. `P ∧ ¬Q ∧ R`

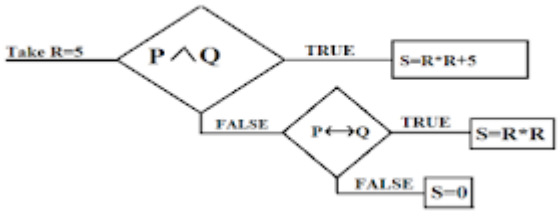
c. `P V Q ∧ R` d. `P V Q ∧ ¬R

81. What is the contrapositive of the conditional statement "I come to class whenever there is going to be a test"?

a. “If I come to class, then there will be a test.”
b. “If I do not come to class, then there will not be a test.”
c. “If there is not going to be a test, then I don’t come to class.”
d. “If there is going to be a test, then I don’t come to class.”

82. Let `a` and `b` are the legs of a right triangle with hypotenuse `c` A sufficient condition that a triangle `T` be a right angled triangle is that `a^2 + b^2 = c^2`.An equivalent statement is
a. If T is a right angled triangle then `a^2 + b^2 = c^2`
b. If `a^2 + b^2 = c^2` then T is a right triangle.
c. `a^2 + b^2 ≠ c^2`Then T is not a right triangle.
d. T is a right triangle only if `a^2 + b^2 = c^2`

83. Let P: `R^2 - 5 = 10` Q:`R^2 - 5 = 20`
And consider the following flow chart of a computer program
Then the value of S is



a. 30 b. 25
c. 0 d. 10
Answer : Option (c)

84. Which one of the following is the most appropriate logical formula to represent the statement? “Students who know Mathematical , coding skills are placed”.

The following notations are used: M(x): x is knowing the Mathematical skills C(x): x is knowing the Coding skills P(x): x is placed

a. $\forall x (P(x) \rightarrow (M(x) \wedge C(x)))$
b. $\forall x((M(x) \wedge C(x)) \rightarrow P(x))$
c. $\exists x((M(x) \wedge C(x)) \rightarrow P(x)$
d. $\forall x((M(x) \vee C(x)) \rightarrow P(x))$

85. P and Q are two propositions. Which of the following logical expressions are equivalent?

`p ∨ ~ Q`
`~(~P∧Q)`
`(P∧Q)∨(P∧~Q)∨(~P∧~Q)`
`(P∧Q)∨(P∧~Q)∨(~P∧Q)`

a. Only I and II
b. Only I, II and III
c. Only I, II and IV
d. All of I, II, III and IV

86. Which of the following statement is a proposition?

a. Get me a glass of milkshake.
b. God bless you!
c. What is the time now?
d. The only odd prime number is 2.

87. Which of the following option is true?

a. If the Sun is a planet, elephants will fly
b. 3 +2 = 8 if 5-2 = 7
c. 1 > 3 and 3 is a positive integer.
d. -2>3 0r 3 is a negative integer.

88. What is the value of x after this statement, assuming the initial value of x is 5?

'If x equals to one then x=x+2 else x=0'.

a. 1 b. 3

c. 0 d. 2

89. Let P: I am in Bangalore.; Q: I love cricket.; then q -> p(q implies p) is?

a. If I love cricket then I am in Bangalore.
b. If I am in Bangalore then I love cricket.
c. I am not in Bangalore.
d. I love cricket.

90. Let P: If Sahil bowls, Saurabh hits a century.; Q: If Raju bowls, Sahil gets out on first ball. Now if P is true and Q is false then which of the following can be true?

a. Raju bowled and Sahil got out on first ball.
b. Raju did not bowl.
c. Sahil bowled and Saurabh hits a century.
d. Sahil bowled and Saurabh got out.

91. Let P: I am in Delhi.; Q: Delhi is clean.; then q ^ p(q and p) is?

a. Delhi is clean and I am in Delhi.
b. Delhi is not clean or I am in Delhi.
c. I am in Delhi and Delhi is not clean.
d. Delhi is clean but I am in Mumbai.

92. Let P: This is a great website, Q: You should not come back here. Then 'This is a great website and you should come back here.'

is best represented by?

a. ~P V ~Q b. P ∧ ~Q
c. P V Q d. P ∧ Q

93. Let P: We should be honest., Q: We should be dedicated., R: We should be overconfident. Then 'We should be honest or dedicated but not overconfident.' is best represented by?

a. ~P V ~Q V R b. P ∧ ~Q ∧ R
c. P V Q ∧ R d. P V Q ∧ ~R

94. What is the domain of a function?

a. the maximal set of numbers for which a function is defined
b. the maximal set of numbers which a function can take values
c. it is a set of natural numbers for which a function is defined
d. none of the mentioned

95. What is domain of function $f(x)= x^{1/2}$?

a. $(2, \infty)$ b. $(-\infty, 1)$
c. $[0, \infty)$ d. None of the mentioned

96. What is the range of a function?

a. the maximal set of numbers for which a function is defined
b. the maximal set of numbers which a function can take values
c. it is set of natural numbers for which a function is defined
d. none of the mentioned

97. What is domain of function $f(x) = x^{-1}$ for it to be defined everywhere on domain?

a. $(2, \infty)$ b. $(-\infty, \infty) - \{0\}$

c. $[0, \infty)$ d. None of the mentioned

98. The range of function $f(x) = \sin(x)$ is $(-\infty, \infty)$.

a. True b. False

c. 1 d. neither true nor false.

99 .Codomain is the subset of range.

a. True b. False

c. 1 d. neither true nor false.

100. What is range of function $f(x) = x^{-1}$ which is defined everywhere on its domain?

a. $(-\infty, \infty)$ b. $(-\infty, \infty) - \{0\}$

c. $[0, \infty)$ d. None of the mentioned

101. If $f(x) = 2^x$ then range of the function is?

a. $(-\infty, \infty)$ b. $(-\infty, \infty) - \{0\}$

c. $(0, \infty)$ d. None of the mentioned

102. If $f(x) = x^2 + 4$ then range of $f(x)$ is given by?

a. $[4, \infty)$ b. $(-\infty, \infty) - \{0\}$

c. $(0, \infty)$ d. None of the mentioned

103. Let $f(x)=\sin^2(x) + \log(x)$ then domain of $f(x)$ is $(-\infty, \infty)$.

a. True b. False

c. 1 d. 0 and 1

104. A ------ is an ordered collection of objets.

a. relation b. function

c. proposition d. set

105. Mathematical _____ establishes whether an ordinary result involving natural numbers is valid?

a. Inflation b. Induction
c. Intuition d. Inhibition

106. P (n) is ___ for $n = n_0$.?

a. True b. False
c. Not predictable d. None of the above

107. If P (k) is true for n = k then -?

a. P (K+1) must also be true
b. P (n) is true for all $n \geq n_0$
c. Both a and b
d. None of the above

108. In Inclusion-Exlusion Principle, if A and B are any two finite sets then -?

a. $n (A \cap B) = n (A) + n (B) - n (A \cap B)$
b. $n (A \cup B) = n (A) + n (B) - n (A \cup B)$
c. $n (A \cup B) = n (A) + n (B) - n (A \cap B)$
d. $n (A \cup B) = n (A) + n (B) + n (A \cap B)$

109. Binary relations R are defined as subsets of P x Q from a set P to Q if P and Q are ____ sets?

a. Empty b. Non-empty
c. Half Empty d. None

110. A and B are related by the constant R if -?

a. $(a, b) \in R$ b. $R \subseteq P \times Q$

c. Both a and b d. None of the above

111. We say R ⊆ P x P is a relationship on P if P and Q are ____?
a. Equivalent b. Non-equivalent
c. Equal d. Non-equal

112. In relation R, the domain is all ____ entries of all pairs that relate some elements in P to some elements in Q.?
a. First b. Second
c. Third d. Last

113. Domain of a relation is denoted by -?
a. RAN (R) b. DOM (R)
c. DAM (R) d. DOMA (R)

114. In R, the range is comprised of all ____ entries belonging to ordered pairs whose elements relate to some element in Q?
a. First b. Second
c. Third d. Last

115. Range of a relation is denoted by -?

a. RANGE (R) b. RAN (R)
c. RANG (R) d. R (R)

116. In case of complement of a relation -?
a. $R = \{(a, b): \{a, b) \in R\}$. b. $R = \{(a, b): \{a, a) \notin R\}$.
c. $R = \{(a, b): \{b, b) \notin R\}$. d. $R = \{(a, b): \{a, b) \notin R\}$.

117. When every element of set A has a copy of itself, it is called the identity function, f (a) = ___?

a. a ∀ A ∈ a
b. A ∈ A
c. a ∀ A ∈ A
d. a ∀ a ∈ A

118. Identity function is denoted by the symbol -?

a. ID
b. I
c. U
d. T

119. If f: X -> Y is a _____ function, it is invertible?

a. Dijective
b. Discretive
c. Bijective
d. Bipolar

120. If f^-1 is a function from ___, there is an inverse function for f?

a. X to Y
b. X to X
c. Y to X
d. Y to Y

121. g [f(x)] is known as -?

a. gox
b. gof
b. gfx
d. gxf

122. _____ if f is A -> B and g is B -> C, which means composition of f with g is a function from A into C?

a. (gof) (y) = g [f(x)]
b. (gof) (x) = g [f(y)]
c. (gof) (x) = g [x(x)]
d. (gof) (x) = g [f(x)]

123. It is necessary to _____ in order to find the composition of f and g?

a. find the image of f(x) under f before finding the image of f (x) under g

b. find the image of x under f before finding the image of f (x) under f

c. find the image of x under g before finding the image of f (x) under g

d. find the image of x under f before finding the image of f (x) under g

124. The function (gof) (gof) is _____ if f and g are one-to-one?

a. One-to-one b. One-to-many

c. Many-to-one d. Many-to-many

125. Functions (gof) (gof) are onto if f and g are ___?

a. Into b. Onto

c. To d. None

126. There is no commutative property in composition, but ____ property is present consistently?

a. Associative b. Identity

c. Duplicative d. None

127. A predicate is a proposition containing ____, which is what's dealt with in predicate logic?

a. Statics b. Variables

c. Numbers d. None

128. Predicates represent one or more variables that are determined on a specific ____?

a. Domain b. Co-domain

c. Both a and b d. None of the above

129. By _____, a predicate with variables can be made into a proposition?

a. Authorizing a value to a variable b. Quantifying variable
c. Both A and B d. None of the above

130. A ____ quantifies a variable of a predicate?

a. Proposition b. Quantity
c. Quality d. Quantifier

131. How many types of quantifier are there in predicate logic?

a. 2 b. 3
c. 4 d. 5

132. Which of the following is/are the type(s) of quantifier in predicate logic?

a. Existential b. Universal
c. Both A and B d. None of the above

133. In case of existential quantifer, the proposition p(x) over the universe U is denoted by ____?

a. x∃p(x) b. p(x)∃x
c. p(x)x∃ d. ∃x p(x)

134. ∃x p(x) is read as -?

a. There exists one value in the universe of variable x such that p(x) is true
b. There exists at least one value in the universe of variable x such that p(x) is false
c. There exists at least one value in the universe of variable p(x) such that x is true

d. There exists at least one value in the universe of variable x such that p(x) is true

135. Quantifier ∃ is called _____ quantifier?
a. Existential b. Universal
c. Both A and B d. None of the above

136. An existential quantifier can be written in which way(s) in a proposition -?
a. (∃x∈A)p(x) b. ∃x∈A such that p (x)
c. (∃x)p(x) d. All of the above

137. In case of universal quantifier, the proposition p(x) over the universe U is denoted by ____?
a. x∀p(x) b. p(x),∃∀
c. p(x),x∀ d. ∀x,p(x)

138. ∀x,p(x) is read as -?
a. For every x∈U,p(x) isfalse b. For every x∈p(x) is true
c. For every x∈U,p(x) is true d. For every p(x) is true

139. Quantifier ∀ is called ____ quantifier?
a. Existential b. Universal
c. Both A and B d. None of the above

140. An universal quantifier can be written in which way(s) in a proposition -?
a. ∀x∈A,p(x) b. p(x), ∀x ∈A
c. ∀x,p(x) d. All of the above

141. Which of the following statement is/are TRUE?

a. An existentially quantified proposition arises from negating a universally quantified proposition
b. An universally quantified proposition arises from negating a existentially quantified proposition
c. Both A and B
d. None of the above

142. What is the rule for the negation of quantified proposition?
a. Dissociative law
b. Associative law
c. Demorgan's law
d. Identity law

143. Multiple quantifiers can be used to quantify propositions with _____ variable?
a. One
b. Two
c. More than one
d. None

144. _____ to arrange the multiple universal quantifiers or existential quantifiers in a particular order in order to make the proposition meaningful?
a. It is necessary
b. It is not necessary
c. Sometimes it is necessary
d. None of the above

145. It is impossible to change the order of the quantifiers of the proposition containing ____ quantifiers without altering the meaning of the proposition?
a. Universal
b. Existential
c. Both A and B
d. None of the above

146. Proposition $\exists x \forall y\, p(x,y)$ means -?
a. There exists some x such that p (x, y) is false for every y.

b. There exists some x such that p (x, y) is true for every x.
c. There exists some y such that p (x, y) is false for every y.
d. There exists some x such that p (x, y) is true for every y.

147. If proposition P is true under all circumstances, it is a ____?
a. Boolean b. Tautology
c. Contradiction d. Binomial

148. The truth table contains only T in the ____ column in tautology?
a. Initial b. Middle
c. Final d. None

149. _____ are statements that are always false?
a. Boolean b. Negation
c. Contradiction d. Tautology

150. Contingencies are statements that are ____ based on the truth values of their variables?
a. True b. False
c. Both A and B d. None of the above

151. If p is ___ and q is ____, then $(p \rightarrow q) \leftrightarrow (\sim q \rightarrow \sim p)$ is true?
a. True, false b. False, true
c. True, true d. All of the above

152. If p is ___ and ~p is ____, then $p \wedge \sim p$ is false?
a. True, false b. False, true
c. Both A and B d. None of the above

153. If p is ___ and q is ____, then $(p \rightarrow q) \rightarrow (p \wedge q)$ is true?
a. True, true b. True, false

c. Both A and B d. None of the above

Answer: c) Both A and B

154. If p is ___ and q is ____, then $(p \rightarrow q) \longrightarrow (p \wedge q)$ is false?

a. False, false b. False, true

c. Both A and B d. None of the above

155. What is/are the meaning of conditional statement when there are two statements p and q?

a. If p then q b. If q then p

c. Both A and B d. None of the above

156. Conditional statement is also known as -?

a. Negation b. Conjunction

c. Disjunction d. Implication

157. Conditional statement is denoted by -?

a. $\rightarrow$ b. $\sim$

c. $\leftrightarrow$ d. None

158. In implication $p \rightarrow q$, p is known as -?

a. Hypothesis b. Antecedent

c. Both A and B d. None of the above

159. In implication $p \rightarrow q$, q is known as -?

a. Conclusion b. Consequent

c. Both A and B d. None of the above

160. If p is ____ and q is ____, then $p \rightarrow q$ is true?

a. True, true b. False, true

c. False, false d. All of the above

161. Which of the following is/are the conditional statement?

a. If p=q and q=r, then p=r.
b. If I get admission, then I will give exam.
c. Both A and B
d. None of the above

162. What is/are the variation(s) in conditional statement?

a. Contrapositive b. Converse
c. Inverse d. All of the above

163. Contrapositive of p →q is the proposition ____?

a. ~p→~q b. ~q→~p
c. q→~p d. ~q→p

164. Converse of p →q is the proposition ___?

a. ~q→p b. q→~p

167. Biconditional statement is also known as -?
a. Equivalance b. Conjunction
c. Disjunction d. Implication

167. Biconditional statement is denoted by -?
a. → b. ~
c. ↔ d. None

168. If p is ___ and q is ___, then p↔q is false?
a. True, false b. False, true
c. Both A and B d. None of the above

169. By substituting ∧ (AND) by ∨ (OR) by ∧ (AND), two formulas A1 and A2 become ___ of each other?
a. Equivalent b. Duals
c. Equals d. Same

170. Which of the following statement(s) is/are TRUE?
a. AND and OR are dual of each other
NOR are dual of each other
that any formula of the proposition holds true
bove

ositions have exactly the same truth values
cumstance, they are said to be _____?
equivalent b. Logical
d. Logically equivalent

mpotent law(s)?
b. p ∧ p≅p

atics

c. Both A and B d. None of the above

173. What is associative law?
a. $(p \vee q) \vee r \cong p \vee (q \vee r)$ b. $p \vee q \cong q \vee p$
c. $p \vee (q \wedge r) \cong (p \vee q) \wedge (p \vee r)$ d. $\neg\neg p \cong p$

174. What is commutative law?
a. $p \vee \neg p \cong T$ b. $\neg(p \vee q) \cong \neg p \wedge \neg q$
c. $p \vee q \cong q \vee p$ d. $p \vee (q \wedge r) \cong (p \vee q) \wedge (p \vee r)$

175. What is distributive law?
a. $p \vee (q \wedge r) \cong (p \vee q) \wedge (p \vee r)$ b. $\neg(p \vee q) \cong \neg p \wedge \neg q$
c. $\neg\neg p \cong p$ d. $p \vee F \cong p$

176. What is/are identity law(s)?
a. $p \vee F \cong p$ b. $p \wedge T \cong p$
c. $p \wedge F \cong F$ d. All of the above

177. What is involution law?
a. $\neg(p \vee q) \cong \neg p \wedge \neg q$ b. $p \vee \neg p \cong T$
c. $\neg\neg p \cong p$ d. None of the above

178. What is/are complement law(s)?
a. $p \vee \neg p \cong T$ b. $p \wedge \neg p \cong T$
c. Both A and B d. None of the above

179. What is/are demorgan's law(s)?
a. $\neg(p \vee q) \cong \neg p \wedge \neg q$ b. $\neg(p \wedge q) \cong \neg p \vee \neg q$
c. Both A and B d. None of the above

180. ____ are declarative sentences that are true or false?
a. Statements
b. Propositions
c. Both A and B
d. None of the above

181. Which of the following statement is/are proposition(s)?
a. Narendra Modi is our current prime minister.
b. Yesterday it was rainy day.
c. a.a means a^2.
d. All of the above

182. Which of the following statement is/are not proposition(s)?
a. Pick up the bottle
b. What is your address?
c. a^a=20
d. All of the above

183. Propositions are represented by lower case letters starting with _?
a. P
b. U
c. A
d. X

184. Through logical connectives (operators), statements can be combined into a single statement called a ____ statement?
a. Collabrative
b. Doubled
c. Combined
d. Compound

185. Which of the following is/are logical connective(s)?
a. ~
b. ∧
c. ⟶
d. All of the above

186. Name of ~ is?
a. Negation
b. Conjunction

c. Disjunction d. None of the above

187. Connective of ~ is?
a. Not b. And
c. Or d. None

188. Name of ∧ is?
a. Negation b. Conjunction
c. Disjunction d. Implication

189. Name of ∨ is?
a. Conditional b. Biconditonal
c. Disjunction d. Implication

190. Name of ⟶ is/are -?
a. Implication b. Conditional
c. Both A and B d. None of the above

191. Connective of ⟶ is/are -?
a. Implies b. If…then
c. Both A and B d. None of the above

192. Name of ⟷ is/are -?
a. Equivalence b. Biconditional
c. Both A and B d. None of the above

193. Connective of ⟷ is -?
a. If b. Only if
c. If and only if d. None

194. A pigeonhole is occupied by more than one pigeon if n pigeonholes are occupied by ___ or more pigeons?
a. n b. n+1
c. n-1 d. None of the above

195. There must be at least one pigeonhole occupied by k+1 or more pigeons if n pigeonholes are occupied by ___ or more pigeons, where k is a positive integer?
a. k+1 b. n+1
c. kn+1 d. kn-1

196. There are various orders of differences of f (x) in a ____ relationship between the independent variable x and the dependent variable f(x)?
a. Occurrence b. Recurrence
c. Deviant d. Variable

197. Recurrence relation can be used interchangeably with a ____ to refer to a recurrence relation?
a. Dividend Equation b. Divisional Equation
c. Difference Equation d. Data Equation

198. It is defined as the difference between ____ highest and lowest subscripts to determine the order of the recurrence relation or difference equation?
a. f(x) b. $a_r=y_k$
c. Both A and B d. None of the above

199. Defining degree of a difference equation as the ____ power of f (x) or $a_r=y_k$?
a. Highest b. Lowest

c. Average d. Middle

200. Consider G a non-void set where every pair of ordered elements of G will have an element of G denoted by a * b. How many properties are true, when we can say that G is a binary group?
a. One b. Two
c. Three d. Four

201. Consider G a non-void set where every pair of ordered elements of G will have an element of G denoted by a * b. If the following property/ies are true, then we can say that G is a binary group -
a. Associativity b. Identity
c. Inverse d. All of the above

202. Associative property on binary operation * states that -
a. $a*(b*c)=(a*b)*c, \forall\ a,b,c \in G$
b. $a*e=e*a=a, \forall\ a \in G$
c. $a*b=b*a=e, \forall\ a, b \in G$
d. None

203. Identity property on binary operation * states that -
a. $a*(b*c)=(a*b)*c, \forall\ a,b,c \in G$
b. $a*e=e*a=a, \forall\ a \in G$
c. $a*b=b*a=e, \forall\ a, b \in G$
d. None

204. Inverse property on binary operation * states that -
a. $a*(b*c)=(a*b)*c, \forall\ a,b,c \in G$
b. $a*e=e*a=a, \forall\ a \in G$

c. $a*b=b*a=e, \forall\ a, b \in G$
d. None

205. The group is called abelian if it has the property of ____law.
a. Associative b. Identity
c. Inverse d. Commutative

206. ___ identity element exists in a Group G (unique identity).
a. One b. Two
c. Three d. Four

207. If a is unique in a group G, then b is unique in G so that ____ (uniqueness if inverses).
a. ab = ba b. ab = e
c. ba = e d. ab = ba = e

208. The Group G is defined as ____,$\forall\ a \in G$.
a. $(a^{-1})=a$ b. $(a)^{-1}=a$
c. $(a^{-1})^{-1}=a$ d. $(a\text{-}1^{-1})^{-1}=a$

209. As part of Group G, ____,$\forall\ a,b \in G$.
a. $(a\ b)=b^{-1}a^{-1}$ b. $(a\ b^{-1})=ba^{-1}$
c. $(a\ b^{-1})=b^{-1}a$ d. $(a\ b^{-1})=b^{-1}a^{-1}$

210. It follows that the left and right cancellation laws apply to group G, which means -
a. ab = ac implies b=c b. ba=ca implies b=c
c. Both A and B d. None of the above

211. ____ groups are those for which the set G is ____.

a. Finite, finite
b. Infinite, infinite
c. Both A and B
d. None of the above

212. Counting the elements in the group G determines the ____ of the group.
a. Number
b. Elements
c. Order
d. Pair

213. Order of group G is denoted by -
a. <G>
b. |G|
c. G
d. *G

214. There is only one identity element in an order _ group, i.e., ({e} *).
a. 1
b. 2
c. 3
d. 4

215. There are two elements in a group of order 2, namely, ____.
a. Identity, Other
b. Identity, Identity
c. Inverse, Inverse
d. Associative, Inverse

216. Three elements make up order 3, namely an ____ element and two ___ elements.
a. Identity, Identity
b. Inverse, Associative
c. Associative, Identity
d. Identity, Other

217. What is the domain of a function?
a. the maximal set of numbers for which a function is defined
b. the maximal set of numbers which a function can take values
c. it is a set of natural numbers for which a function is defined

d. none of the mentioned

218. What is domain of function $f(x)= x^{1/2}$?

a. $(2, \infty)$ b. $(-\infty, 1)$

c. $[0, \infty)$ d. None of the mentioned

219. What is the range of a function?

a. the maximal set of numbers for which a function is defined

b. the maximal set of numbers which a function can take values

c. it is set of natural numbers for which a function is defined

d. none of the mentioned.

220. What is domain of function $f(x) = x^{-1}$ for it to be defined everywhere on domain?

a. $(2, \infty)$ b. $(-\infty, \infty) - \{0\}$

c. $[0, \infty)$ d. None of the mentioned

221. The range of function $f(x) = \sin(x)$ is $(-\infty, \infty)$.

a. True b. False

222. Codomain is the subset of range.

a. True b. False

223. What is range of function $f(x) = x^{-1}$ which is defined everywhere on its domain?

a. $(-\infty, \infty)$ b. $(-\infty, \infty) - \{0\}$

c. $[0, \infty)$ d. None of the mentioned

224. If $f(x) = 2^x$ then range of the function is?
   a. $(-\infty, \infty)$ b. $(-\infty, \infty) - \{0\}$
   c. $(0, \infty)$ d. None of the mentioned

225. If $f(x) = x^2 + 4$ then range of f(x) is given by?
   a. $[4, \infty)$ b. $(-\infty, \infty) - \{0\}$
   c. $(0, \infty)$ d. None of the mentioned

226. Let $f(x)=\sin^2(x) + \log(x)$ then domain of f(x) is $(-\infty, \infty)$.
   a. True b. False

227. Which of the following statement is a proposition?
   a. Get me a glass of milkshake
   b. God bless you!
   c. What is the time now?
   d. The only odd prime number is 2

228. The truth value of '4+3=7 or 5 is not prime'.
   a. False b. True

229. Which of the following option is true?
   a. If the Sun is a planet, elephants will fly
   b. 3 +2 = 8 if 5-2 = 7
   c. 1 > 3 and 3 is a positive integer
   d. -2 > 3 or 3 is a negative integer

230. What is the value of x after this statement, assuming the initial value of x is 5?
   'If x equals to one then x=x+2 else x=0'.

a. 1 b. 3
c. 0 d. 2

231. Let P: I am in Bangalore.; Q: I love cricket.; then q -> p(q implies p) is?
a. If I love cricket then I am in Bangalore
b. If I am in Bangalore then I love cricket
c. I am not in Bangalore
d. I love cricket

232. Let P: If Sahil bowls, Saurabh hits a century.; Q: If Raju bowls, Sahil gets out on first ball. Now if P is true and Q is false then which of the following can be true?
a. Raju bowled and Sahil got out on first ball
b. Raju did not bowled
c. Sahil bowled and Saurabh hits a century
d. Sahil bowled and Saurabh got out

232. The truth value '9 is prime then 3 is even'.
a. False b. True

233. Let P: I am in Delhi.; Q: Delhi is clean.; then q ^ p(q and p) is?
a. Delhi is clean and I am in Delhi
b. Delhi is not clean or I am in Delhi
c. I am in Delhi and Delhi is not clean
d. Delhi is clean but I am in Mumbai

234. Let P: This is a great website, Q: You should not come back here. Then 'This is a great website and you should come back here.' is best represented by?

a. ~P V ~Q
b. P ∧ ~Q
c. P V Q
d. P ∧ Q

235. Let P: We should be honest., Q: We should be dedicated., R: We should be overconfident. Then 'We should be honest or dedicated but not overconfident.' is best represented by?
a. ~P V ~Q V R
b. P ∧ ~Q ∧ R
c. P V Q ∧ R
d. P V Q ∧ ~R

236. The Hasse Diagram provides a complete description of the _____ partial order.
a. Associated
b. Complimentary
c. Supplementary
d. Non-Supplementary

237. Hasse diagram is also called -
a. Ordered Diagram
b. Unordered Diagram
c. Partial Ordered Diagram
d. Partial Unordered Diagram

238. Creating an equivalent Hasse diagram from a _____ graph of a relation on a set A is very straightforward.
a. Undirected
b. Directed
c. Partial undirected
d. Partial directed.

239. Instead of circles, Hasse diagrams have _____ that represent vertices.
a. Nodes
b. Points
c. Squares
d. Subpoints

240. Due to the _____ nature of partial orders, in Hasse diagrams, edges between vertices are deleted.

a. Transitive b. Reflexive
c. Associative d. Distributive

241. Since partial orders are ____, we have aRc in the case of aRb, bRc.
a. Transitive b. Reflexive
c. Distributive d. Associative

242. In Hasse diagrams, remove the ____ implied by the transitive property, i.e., delete the edge from a to c while keeping the other two edges.
a. Vertices b. Edges
c. Lines d. Directed lines.

243. The vertex 'b' appears above vertices 'a' if they are connected by an edge, e.g., ___.
a. aRa b. aRb
c. bRb d. None

244. In the Hasse diagram, the arrow may be _____ from the edges.
a. Replaced b. Omitted
c. Added d. None of the above

245. A subset of a partially ordered set A will be called an upper bound of B if ____ for every $y \in B$.
a. $y \leq x$ b. $x \leq y$
c. $y \leq R$ d. $x \leq R$

246. When B is a subset of a partially ordered set A, an element z is referred to as a ____ bound of B.
a. Upper b. Lower

c. Side d. Inner

247. In S, M is called an upper bound of A if it succeeds all elements of A, i.e., if x in A ___ M, then M is said to be an upper bound of A.
a. Is equal to b. Is less than
c. Is greater than d. None of the above

248. ____ (A) indicates an upper bound of A that precedes all other upper bounds of A.
a. Sup b. Inf
c. Sub d. Super

249. Lower bounds for a subset A of S are defined as elements m in S preceding every element in A, i.e., if, for every y in A, _____.
a. m<=y b. m>=y
c. m<=A d. m<=S

250. A lower bound is called the ____ of A if it exceeds all lower bounds of A.
a. Supremum b. Infimum
c. Side Upper d. Side Lower

251. Assume that L is a non-empty set closed only under two binary operations, ____, denoted by ∧ and ∨. It is called a lattice if L has a, b, and c elements, where a, b, and c are the elements in L.
a. Meet b. Join
c. Both A and B d. None of the above

252. Axioms that lattice L holds are -

a. Commutative law
b. Associative law
c. Absorption law
d. All of the above

253. An expression's dual is the expression that can be obtained by _____ ∧ and ∨.
a. Mixing
b. Interchanging
c. Adding
d. Removing

254. The following identities are valid if L is a bounded lattice:
a. a ∨ 1 = 1
b. a ∧1= a
c. a ∨0=a
d. All of the above

255. A non-empty subset L_1 of a lattice L is considered. It can be realized that L_1 is a ____-lattice of L if it itself is a lattice, i.e., whenever a ∨ b ∈ L_1 and a ∧ b ∈ L_1 whenever a ∈ L_1 and b ∈ L_1.
a. Super
b. Sub
c. Side
d. None

256. Two lattices L_1 and L_2 are called isomorphic lattices if there is a ____ from L_1 to L2.
a. Dijection
b. Bijection
c. Rejection
d. None

257. If any element a, b, or c of a lattice L satisfies the following distributive properties, it is called a distributive lattice:
a. a ∧ (b ∨ c) = (a ∧ b) ∨ (a ∧ c)
b. a ∨ (b ∧ c) = (a ∨ b) ∧ (a ∨ c)
c. Both A and B
d. None of the above

258. ____ lattices are those that do not satisfy the above properties.
a. Non-distributive b. Distributive
c. Associative d. Non-associative

259. An upper bound I and a lower bound o define a bounded lattice L. Assume that a is an element if L. In L, a complementary element x is an element within an if _____.
a. $a \vee x = I$ b. $a \wedge x = 0$
c. Both A and B d. None of the above

260. _____ are bounded and contain complements for each element.
a. Complimented lattices b. Uncomplimented lattices
c. Conceptional d. Unconceptional lattices

261. (L, b, c) is a modular lattice if $a \vee (b \wedge c) = (a \vee b) \wedge c$ whenever ____.
a. $b \leq c$ b. $a \leq b$
c. $a \leq c$ d. None

262. $(L, \wedge, \vee)$ is the ____ of lattices, where $L = L_1 \times L_2$ where the binary operations (join) and (meet) on L are such that for any (a_1,b_1) and (a_2,b_2) in L.
a. Direct product b. Indirect product
c. Direct sum d. Indirect sum

263. Which of the following properties are satisfied by the relation R on the set S?
a. A reflexive function (R) returns xRx when $x \in S$.

b. There is an antisymmetry in R, so if xRy and yRx, then x = y.
c. The R function is transitive; if xRy and yRz, then xRz follows.
d. All of the above

264. ____ relationships are referred to as R.
a. Ordered
b. Unordered
c. Partially ordered
d. Partially unordered

265. A partially ordered set (_____) is a set with partial order combined with S.
a. POSET
b. PASET
c. PAOET
d. POS

266. POSET is denoted by -
a. (≤, S)
b. (S, ≤)
c. (>=, S)
d. (S, >=)

267. ____ elements of A are those where a ≤ c in A does not contain elements in c.
a. Maximal
b. Minimal
c. Both A and B
d. None of the above

268. A _____ element of A is a data structure in which the element in c in A cannot be changed.
a. Maximal
b. Minimal
c. Both A and B
d. None of the above

269. It is possible to have ___ maximal element or ___ minimal element.
   a. One, more than one
   b. Two, more than one
   c. More than one, more than one
   d. More than one, Zero

270. A pair of elements a and b of set A is comparable if -
   a. $a \leq b$ b. $b \leq a$
   c. Both A and B d. None of the above

271. In set A, two elements a and b cannot be compared even if neither ____.
   a. $a \leq b$ b. $b \leq a$
   c. Both A and B d. None of the above

272. When all elements in set A are comparable, it's called a ____.
   a. Linearly Ordered Set b. Totally Ordered Set
   c. Both A and B d. None of the above

273. In Boolean algebra B, a Boolean expression is defined as -
   a. The elements of B are all Boolean expressions.
   b. Boolean expressions are used to name variables.
   c. If a_1 and a_2 are Boolean expressions, then a_1,'$\vee$ a_2 and $a_1 \wedge a_2$ are Boolean expressions.
   d. All of the above

274. Boolean expressions containing n distinct variables are normally referred to as Boolean ____ of n variables.
   a. Functions b. Laws

c. Expressions d. Algebras

275. The Boolean Expression E (x_1,x_2,....x_n) is a set of n variables over a Boolean algebra B. An assignment of values to variables x_1, x_2, ... x_n means assigning elements of A as variables' values. ____ the variables in the expression by their values will allow us to evaluate E (x_1, x_2, ... x_n).

a. Adding b. Subtracting

c. Multiplying d. Substituting

276. When n variables are assigned the same value for every assignment, two Boolean expressions are said to be _____.

a. Equal b. Unequal

c. Zero d. Similar

277. ____ indicates that E_1(x_1,x_2,....x_n) and E_2(x_1,x_2,....x_n) are equivalent.

a. E_1(x_1,x_2,....x_n)+E_2(x_1,x_2,....x_n)

b. E_1(x_1,x_2,....x_n)-E_2(x_1,x_2,....x_n)

c. E_1(x_1,x_2,....x_n)=E_2(x_1,x_2,....x_n)

d. E_1(x_1,x_2,....x_n)!=E_2(x_1,x_2,....x_n)

278. A Boolean Expression composed of n variables is a ____ if it follows the form $\bar{x}_1 \wedge \bar{x}_2 \wedge \bar{x}_3 \wedge .... \wedge \bar{x}_n$ where x_i is used to denote x_i or x_i'.

a. Max-term b. Min-term

c. Median-term d. Mode-term

279. The Boolean Algebra is a complemented ____ lattice.

a. Associative b. Distributive

c. Commutative d. Supplementary

280. Boolean Algebra is denoted by -

a. (B, ∧,∨,',1) b. (B, ∧,∨,',0)

c. (B, ∧,',0,1) d. (B, ∧,∨,',0,1)

281. B is a set on which two binary operations ∧ (*) and ∨(+) and a ____ operation (complement) are defined.

a. Unary b. Binary

c. Ternary d. None

282. Since (B,∧,∨) represents a ____ distributive lattice, each element of B has a unique complement.

a. Complemented b. Supplemented

c. Adjacent d. None

283. What is/are the property/ies of Boolean Algebra?

a. Commutative b. Distributive

c. Identity d. All of the above

284. Commutative Property states that -

a. a+b = b+a b. a*b=b *a

c. Both A and B d. None of the above

285. Distributive Property states that -

a. a+(b*c)=(a+b)*(a+c) b. a*(b+c)=(a*b)+(a*c)

c. Both A and B d. None of the above

286. Identity Property states that -

a. a+0=a b. a *1=a

c. Both A and B d. None of the above

287. Complemented Laws states that -

a. a+a'=1 b. a * a'=0

c. Both A and B d. None of the above

288. If A itself is a Boolean Algebra, then (A,*, +,', 0,1) is a ____ of B.

a. Sub-algebra b. Sub-Boolean Algebra

c. Both A and B d. None of the above

289. Subsets of a Boolean Algebra can be ____, but may or may not be subalgebras because B may not be closed.

a. Algebra b. Boolean Algebra

c. Sub-algebra d. Sub-Boolean Algebra

290. If two Boolean algebras B and B1 go together one to one, then they are called ____ and are preserved for all elements from B including a, b in B.

a. Isomorphic b. Boolean Functions

c. Boolean Expressions d. None of the above

291. Which of the following are Isomorphic-Boolean Algebras?

a. f (a+b)=f(a)+f(b) b. f (a*b)=f(a)*f(b)

c. f(a')=f(a)' d. All of the above

292. Which of the following is/are the basic property/ies of Boolean Algebra?

a. Idempotent Law b. Commutative Property

c. Associative Property d. All of the above

293. Which of the following is/are NOT the basic property/ies of Boolean Algebra?
   a. Absorption Laws
   b. Identity Laws
   c. Null Laws
   d. Evolution Laws

294. Which of the following statement is TRUE?
   a. $0 \leq a \leq 1 \ \forall \ a \in B$.
   b. There is a unique complement b' for every element b.
   c. Both A and B
   d. None of the above

295. When a Boolean Expression based on n variables specifies a function from A" to A, it is called a Boolean ____.
   a. Algebra
   b. Expression
   c. Function
   d. Law

296. ____ descriptions of functions are always possible.
   a. Tabular
   b. Graphical
   c. Analytical
   d. None

297. ____ can be used as an alternative method of expressing functions.
   a. Function
   b. Expression
   c. Law
   d. Algebra

298. Two-valued Boolean algebra considers all functions from ____ as Boolean functions.
   a. $[0, 1]^2$ to [0, 1]
   b. $[0, 1]^3$ to [0, 1]
   c. $[0, 1]^{n-1}$ to [0, 1]
   d. $[0, 1]^n$ to [0, 1]

299. It is a normal subgroup of G if for all h∈ H and x∈ G, ____∈ H.
a. x h x^{-1} b. x h x^{+1}
c. x h x d. x h x^{-2}

300. When x H x^{-1} = [x h x^{-1}| h ∈ H} then H is normal in G ____ x H x^{-1}⊆H, ∀ x∈ G.
a. If b. If and only if
c. If not d. None of the above

301. The subgroup H of an abelian group G is normal in G if G is an ____ group.
a. Abelian b. Normal
c. Sub d. None of the above

302. Homomorphisms are mappings such that ____, x, y ∈ G.
a. f (xy) =f(x) f(y) b. f (xy) =f(x) + f(y)
c. f (xy) =f(x) - f(y) d. f (xy) =f(x) / f(y)

303. Even though the binary operations of the groups G and G' are different, the mapping f preserves the ____ operation.
a. Group b. Subgroup
c. Supergroup d. None

304. Even though the binary operations of the groups G and G' are different, the mapping f preserves the group operation. This condition is known as -
a. Hypermorphism b. Homomorphism
c. Heteromorphism d. Hypomorphism

305. A homomorphism of a group G to a group G' with identity e' is a homomorphism with a kernel {x∈ G | f(x) =__'}.
   a. e b. e'
   c. e" d. e'"

306. ____ f represents the kernel of f.
   a. f b. K f
   c. Ker f d. None

307. The ____ set of f consists of the range of the map f, denoted by f (G).
   a. Direction b. Line
   c. Image d. Circle

308. Homomorphic images of G are those whose f (G) = ____.
   a. G b. G'
   c. F d. F'

309. A semi-group is defined as one that satisfies these properties:
   a. An operation * on set A is a closed operation.
   b. Operation * is an associative operation.
   c. Both A and B
   d. None of the above

310. Suppose we have a semigroup (A, *) and let B ⊆ A. ____ are formed when sets B are closed under operations *.
   a. Semigroups b. Supersemigroups
   c. Subsemigroups d. None

311. ' ° ' is a -

a. Grouping Operation b. Concatenation Operation
c. Conversion Operation d. None

312. (A*,°) is a -
a. Semigroup b. Subsemigroup
c. Supersemigroup d. None

313. Semigroup (A*,°) generated by set A is known as -
a. Bound Semigroup b. Free semigroup
c. Partial semigroup d. Partially bound semigroup

314. The algebraic system (A, o) consists of the binary operation o on A. If (A, o) satisfies the following property/ies, then it is said to be a monoid:
a. Set A can only be operated on by the operation o.
b. Associative operations are based on the o operation.
c. A unique element exists, namely the operation o.
d. All of the above

315. When (S, o) satisfies the following properties, then it is called a submonoid of (M, o) -
a. A closed operation is carried out under operation o.
b. It is possible to identify an element by its identity value e ∈ T.
c. Both A and B
d. None of the above

316. H is a subgroup of G if it is a _____ of G that is itself a group under G's operation.
a. Void Set b. Non-void set

c. Void Subset d. Non-void Subset

317. Subsets of groups G are subgroups of G if:
   a. An identity element is a∈ H.
   b. The operation of G closes H, meaning that if a, b∈ H, then a, b∈ H
   c. Inverses of H have closed forms, i.e., if a∈ H then a^{-1}∈ H.
   d. All of the above

318. Subgroups K of a group G are said to be ____ subgroups if every element of K can be expressed in the form xn for some n ∈Z.
   a. Oval b. Cyclic
   c. Spherical d. Centric

319. x is the _____ of group G's subgroup K, and K= <x>.
   a. Function b. Query
   c. Generator d. Supergroup

320. We say that G is cyclic if ____, and x is its generator.
   a. G ≠ x b. G = x
   c. G != x d. G == x

321. A group G is cyclic if every element of G can be written as __ for some n∈ Z.
   a. x^n b. x_n
   c. x^{n-1} d. n^x

322. Suppose we have an algebraic system (G,*), where * is a binary operation on G. An abelian group is one which satisfies

all of the group's properties plus the ____ property of the group's operation.

a. Closed
b. Associative
c. Identity
d. All of the above

323. Let G be a group and H a subgroup. It is possible to express the elements of a left coset of H in G as xH={ __ | h ∈ H } for any x∈ G.

a. xh
b. hx
c. xxh
d. hhx

324. A right coset of H in G is a subset with radius Hx = {__ | h ∈H }, for any x∈G.

a. xh
b. hx
c. xxh
d. hhx

325. A ____ coset and a ____ coset are respectively called complexes xH and Hx.

a. Left, right
b. Right, Left
c. Left, left
d. Right, right

326. If the group operation is additive (+), then _____ = {x+h | h ∈H} denotes a left coset.

a. x + H
b. H + x
c. Both A and B
d. None of the above

327. If the group operation is additive (+), then _____ = {x+h | h ∈H} denotes a right coset.

a. x + H
b. H + x
c. x – H
d. H - x

328. Which of the following is a/the property/ies of binary operations?
a. Closure Property b. Associative Property
c. Commutative Property d. All of the above

329. A non-empty set A and a binary operation * on A are closed under the operation *, if ___ ∈ A, where a and b are elements of A.
a. a*b b. a+b
c. a-b d. a/b

330. There is a non-empty set A, then a binary operation * on A is associative, if for every a, b, c, ∈ A, we have ____.
a. (a + b) * c = a* (b*c) b. (a * b) * c = a* (b*c)
c. (a / b) * c = a* (b*c) d. (a = b) * c = a* (b*c)

331. A non-empty set A gives rise to commutative binary operations, if for each a, b, ∈ A, we have ____.
a. a + b = b * a b. a * b = b + a
c. a - b = b * a d. a * b = b * a

332. If we have a non-empty set A, then we have an identity property when e exists in A, and ____ = a ∀ a ∈ A.
a. a * e (left identity) = e * a (left identity)
b. a * e (right identity) = e * a (right identity)
c. a * e (right identity) = e * a (left identity)
d. e * e (right identity) = e * a (left identity)

333. The operation is the inverse property for a non-empty set A if ∃ an element b in A such that ____ = e, where b is called an inverse of a.

a. a * b (left inverse) = b * a (left inverse)
b. a * b (right inverse) = b * a (right inverse)
c. a * b (right inverse) = b * a (left inverse)
d. a * b (right inverse) = e * a (left inverse)

334. There is a non-empty set A, then the operation * has the ____ property, if for each a ∈A, we have a * a = a ∀ a ∈A.
a. Identity b. Idempotent
c. Individual d. Instinctive

335. We are given a non-empty set A and we are given a binary operation * on A. Then the operation * distributes over +, assuming for each a, b, c ∈A, we have -
a. a * (b + c) = (a * b) + (a * c)
b. (b + c) * a = (b * a) + (c * a)
c. Both A and B
d. None of the above

336. a * (b + c) = (a * b) + (a * c) is -
a. Distributivity b. Left distributivity
c. Right distributivity d. None of the above

337. We are given a non-empty set A and we are given a binary operation * on A, then the operation * has the cancellation property, if for every a, b, c ∈A, we have -
a. a * b = a * c ⇒ b = c b. b * a = c * a ⇒ b = c
c. Both A and B d. None of the above

338. b * a = c * a ⇒ b = c is -
a. Cancellation b. Left Cancellation

c. Right Cancellation d. None of the above

339. As a decision problem, it consists of finding in a finite number of steps whether a statement is____?
a. Tautological b. Contradictory
c. Satisfiable d. All of the above

340. It may not always be feasible to construct a ____ for a Decision Problem?
a. Dataset b. Truth table
c. Data table d. Decision table

341. If the truth table cannot be created, we consider the ____ to normal forms as an alternative?
a. Addition b. Subtraction
c. Reduction d. Division

342. How many types of normal forms are there to which reduction can be performed?
a. 2 b. 3
c. 4 d. 5

343. Full form of DNF is -?
a. Disjoining Normal Form b. Disjunctive Normal Form
c. Divisional Normal Form d. Dividend Normal Form

344. Which of the following is/are the type(s) of normal forms to which reduction can be performed?
a. Disjunctive Normal Form b. Conjunctive Normal Form
c. Both A and B d. None of the above

345. A predicate is a proposition containing ____, which is what's dealt with in predicate logic?
a. Statics b. Variables
c. Numbers d. None

346. Predicates represent one or more variables that are determined on a specific ____?
a. Domain b. Co-domain
c. Both a and b d. None of the above

347. By _____, a predicate with variables can be made into a proposition?
a. Authorizing a value to a variable b. Quantifying variable
c. Both A and B d. None of the above

348. A ____ quantifies a variable of a predicate?
a. Proposition b. Quantity
c. Quality d. Quantifier

349. How many types of quantifier are there in predicate logic?
a. 2 b. 3
c. 4 d. 5

350. Which of the following is/are the type(s) of quantifier in predicate logic?
a. Existential b. Universal
c. Both A and B d. None of the above

351. In case of existential quantifer, the proposition p(x) over the universe U is denoted by ____?
   a. x∃p(x) b. p(x)∃x
   c. p(x)x∃ d. ∃x p(x)

352. ∃x p(x) is read as -?
   a. There exists one value in the universe of variable x such that p(x) is true
   b. There exists at least one value in the universe of variable x such that p(x) is false
   c. There exists at least one value in the universe of variable p(x) such that x is true
   d. There exists at least one value in the universe of variable x such that p(x) is true

353. Quantifier ∃ is called _____ quantifier?
   a. Existential b. Universal
   c. Both A and B d. None of the above

354. An existential quantifier can be written in which way(s) in a proposition -?
   a. (∃x∈A)p(x) b. ∃x∈A such that p (x)
   c. (∃x)p(x) d. All of the above

355. In case of universal quantifer, the proposition p(x) over the universe U is denoted by ____?
   a. x∀p(x) b. p(x),∃∀
   c. p(x),x∀ d. ∀x,p(x)

356. ∀x,p(x) is read as -?
   a. For every x∈U,p(x) isfalse b. For every x∈p(x) is true

c. For every $x \in U, p(x)$ is true d. For every $p(x)$ is true

357. Quantifier $\forall$ is called ____ quantifier?
   a. Existential b. Universal
   c. Both A and B d. None of the above

358. An universal quantifier can be written in which way(s) in a proposition -?
   a. $\forall x \in A, p(x)$ b. $p(x), \forall x \in A$
   c. $\forall x, p(x)$ d. All of the above

359. Which of the following statement is/are TRUE?
   a. An existentially quantified proposition arises from negating a universally quantified proposition
   b. An universally quantified proposition arises from negating a existentially quantified proposition
   c. Both A and B
   d. None of the above

360. What is the rule for the negation of quantified proposition?
   a. Dissociative law b. Associative law
   c. Demorgan's law d. Identity law

361. Multiple quantifiers can be used to quantify propositions with _____ variable?
   a. One b. Two
   c. More than one d. None

362. _____ to arrange the multiple universal quantifiers or existential quantifiers in a particular order in order to make the proposition meaningful?

a. It is necessary b. It is not necessary
c. Sometimes it is necessary d. None of the above

363. It is impossible to change the order of the quantifiers of the proposition containing ____ quantifiers without altering the meaning of the proposition?
a. Universal b. Existential
c. Both A and B d. None of the above

364. Proposition $\exists x \forall y\, p(x,y)$ means -?
a. There exists some x such that p (x, y) is false for every y.
b. There exists some x such that p (x, y) is true for every x.
c. There exists some y such that p (x, y) is false for every y.
d. There exists some x such that p (x, y) is true for every y.

365. How many properties are there in Partial Order Relations?
a. 2 b. 3
c. 4 d. 5

366. Which of the following is a property in Partial Order relations?
a. Reflexive b. Antisymmetric
c. Transitive d. All of the above

367. A partial order set or ____ is the set A coupled with a partial order relation R on the set A?
a. OFFSET b. OPSET
c. POSET d. PFFSET

368. The total order relation on set A is known as _____?
a. $(a, b) \in R$ b. $(b, a) \in R$

c. a = b d. All of the above

369. If (a, b) ∈ R and (b, c) ∈ R implies ____, then R is circular?
a. (a, a) ∈ R b. (a, b) ∈ R
c. (c, a) ∈ R d. (b, a) ∈ R

370. In mathematics, a ____ relation R is called a Compatible Relation?
a. Reflexive b. Symmetric Binary
c. Both a and b d. None of the above

371. A relationship of equivalence must be ____, but a relationship of compatibility does not have to be an equivalence?
a. Compatible b. Composite
c. Cartesian d. Circular

Answers

1.d, 2.a, 3.c, 4.d, 5.b, 6.a, 7.c, 8.c, 9.a, 10.c, 11.d, 12.c, 13.d, 14.b, 15.c, 16.b, 17.a, 18.b, 19.b, 20.c, 21.d, 22.c, 23.b, 24.c, 25.d, 26.a, 27.c, 28.a, 29.c, 30.a, 31.c, 32.a, 33.d, 34.c, 35.a, 36.d, 37.d, 38.a, 39.b, 40.c, 41.a, 42.b, 43.a, 44.c, 45.a, 46.c, 47.d, 48.d, 49.b, 50.b, 51.a, 52.d, 53.a, 54.d, 55.c, 56.d, 57.c, 58.c, 59.d, 60.c, 61.b, 62.c, 63.c, 64.b, 65.b, 66.a, 67.b, 68.c, 69.a, 70.a, 71.b, 72.a, 73.c, 74.a, 75.c, 76.c, 77.a, 78.b, 79.c, 80.d, 81.b, 82.b, 83.c, 84.d, 85.b, 86.d, 87.a, 88.c, 89.a, 90.b, 91.a, 92.b, 93.d, 94.a, 95.c, 96.b, 97.b, 98.b, 99.b, 100.a, 101.c, 102.a, 103.b, 104.d, 105.b, 106.a, 107.c, 108.c, 109.b, 110.c, 111.c, 112.a, 113.b, 114.b, 115.b, 116.d, 117.d, 118.b, 119.c, 120.c, 121.b, 122.d, 123.d, 124.d, 125.b, 126.a, 127.b, 128.a, 129.c, 130.d, 131.a, 132.c, 133.d, 134.d, 135.a, 136.d, 137.d, 138.c,

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