UNIT I LOGIC AND PROOFS

1. What is the negation of the statement "All cats can fly"?

a) No cats can fly

b) Some cats can't fly

c) All cats can't fly

d) Some cats can fly

Answer: c) All cats can't fly

2. Which of the following is a propositional variable?

a) 2+2=4

b) p implies q

c) (x+1)(x-1)=x^2-1

d) There are no unicorns.

Answer: b) p implies q

3. Which of the following is a tautology?

a) p xor q

b) p implies q

c) p and (not p)

d) p or (not p)

Answer: d) p or (not p)

4. What is the contrapositive of the statement "If it rains, then I stay inside"?

a) If I don't stay inside, then it doesn't rain.

b) If I stay inside, then it doesn't rain.

c) If it doesn't rain, then I don't stay inside.

d) If it doesn't rain, then I stay inside.

Answer: b) If I don't stay inside, then it doesn't rain.

5. Which of the following is equivalent to "not (p or q)"?

a) not p and not q

b) not p or not q

c) p and q

d) p or q

Answer: a) not p and not q

6. What is the conclusion of a proof?

a) The statement being proven

b) The assumptions of the proof

c) The logical reasoning used in the proof

d) The definition of key terms in the proof

Answer: a) The statement being proven

7. Which of the following is an example of a vacuous proof?

a) Proving that 2+2=5

b) Proving that all even numbers are divisible by 3

c) Proving that there are no unicorns

d) Proving that all odd numbers are prime

Answer: d) Proving that all odd numbers are prime

8. Which proof strategy involves assuming the negation of the statement being proven and deriving a contradiction?

a) Direct proof

b) Proof by contraposition

c) Proof by contradiction

d) Proof of equivalence

Answer: c) Proof by contradiction

9. Which of the following is an example of a counterexample?

a) Proving that all prime numbers are odd

b) Proving that all cats have fur

c) Proving that all functions are continuous

d) Showing that 2 is not a solution to the equation x^2=3x

Answer: d) Showing that 2 is not a solution to the equation x^2=3x

10. Which of the following is a valid propositional equivalence?

a) p and q = p or q

b) p implies q = q implies p

c) p xor q = not p

d) p and (not p) = p or (not p)

Answer: d) p and (not p) = p or (not p)

11. Which of the following is a universal quantifier?

a) There exists

b) For all

c) Implies

d) Or

Answer: b) For all

12. Which of the following is a valid existential quantifier?

a) For all

b) There exists

c) Implies

d) Or

Answer: b) There exists

13. What is the converse of the statement "If it is raining, then the streets are wet"?

a) If the streets are wet, then it is raining.

b) If it is not raining, then the streets are not wet.

c) If the streets are not wet, then it is not raining.

d) If it is wet outside, then it is raining.

Answer: a) If the streets are wet, then it is raining.

14. Which of the following is an example of a trivial proof?

a) Proving that 2+2=4

b) Proving that all prime numbers are odd

c) Proving that all even numbers are divisible by 3

d) Proving that all cats have fur

Answer: a) Proving that 2+2=4

15. Which proof strategy involves showing that the statement being proven is false by finding a specific example that contradicts it?

a) Direct proof

b) Proof by contraposition

c) Proof by contradiction

d) Proof by counterexample

Answer: d) Proof by counterexample

16. Which of the following is an example of a mistake in a proof?

a) Starting with false assumptions

b) Using valid logical reasoning

c) Using a proof by contradiction

d) Deriving the correct conclusion

Answer: a) Starting with false assumptions

17. Which of the following is equivalent to "not (p implies q)"?

a) p and not q

b) not p and not q

c) p and q

d) not p or q

Answer: a) p and not q

18. What is the hypothesis of a proof?

a) The statement being proven

b) The assumptions of the proof

c) The logical reasoning used in the proof

d) The definition of key terms in the proof

Answer: b) The assumptions of the proof

19. Which proof strategy involves showing that if the negation of the statement being proven is true, then a contradiction arises?

a) Direct proof

b) Proof by contraposition

c) Proof by contradiction

d) Proof of equivalence

Answer: b) Proof by contraposition

20. Which of the following is a valid propositional equivalence?

a) p and q = q or p

b) p implies q = not p or q

c) p xor q = not p and not q

d) p or (not q) = not (p and q)

Answer: d) p or (not q) = not (p and q)

UNIT II RECURRENCE RELATIONS

21. What is a recurrence relation?

A) A mathematical equation that describes a sequence of numbers

B) A function that maps elements of one set to another set

C) A binary operation on a set that is associative, commutative, and has an identity element

D) A relation between two sets that assigns to each element of the first set a set of elements from the second set

Answer: A

22. Which of the following is an example of a recurrence relation?

A) f(x) = 3x + 2

B) g(x) = x^2 + 1

C) h(n) = h(n-1) + 3

D) i(x) = sin(x)

Answer: C

23. How can recurrence relations be used to model real-world phenomena?

A) By describing the behavior of a system over time

B) By mapping the inputs and outputs of a function

C) By creating a graph of a set of data points

D) By computing the average of a set of numbers

Answer: A

24. What is a homogeneous linear recurrence relation with constant coefficients?

A) A recurrence relation where all the coefficients are equal

B) A recurrence relation where all the terms are of the same degree

C) A recurrence relation where the coefficients are constants and the non-homogeneous term is zero

D) A recurrence relation where the coefficients depend on the previous terms

Answer: C

25. Which of the following is an example of a homogeneous linear recurrence relation with constant coefficients?

A) f(n) = n^2 + 2n + 1

B) g(n) = 2g(n-1) + 3g(n-2)

C) h(n) = 3^n

D) i(n) = sin(n)

Answer: B

26. What is the method of inverse operator used for?

A) To solve a non-homogeneous linear recurrence relation with constant coefficients

B) To find the inverse of a matrix

C) To compute the derivative of a function

D) To determine the limit of a sequence

Answer: A

27. Which of the following is not a step in solving a non-homogeneous linear recurrence relation with constant coefficients using the method of inverse operator?

A) Find the homogeneous solution

B) Find the particular solution

C) Solve for the constants using the initial conditions

D) Substitute the particular solution into the recurrence relation

Answer: A

28. What is a generating function?

A) A function that generates a sequence of numbers

B) A function that generates a set of polynomials

C) A function that generates a set of matrices

D) A function that generates a set of functions

Answer: B

29. How can generating functions be used to solve recurrence relations?

A) By finding the inverse of the generating function

B) By computing the Taylor series of the generating function

C) By manipulating the generating function algebraically

D) By taking the limit of the generating function as n approaches infinity

Answer: C

30. Which of the following is the generating function for the Fibonacci sequence?

A) f(x) = 1/(1-x)

B) g(x) = 1/(1-x-x^2)

C) h(x) = 1/(1-2x)

D) i(x) = x/(1-x-x^2)

Answer: B

31. What is the difference between a linear and a nonlinear recurrence relation?

A) A linear recurrence relation involves a linear combination of the previous terms, while a nonlinear recurrence relation involves a nonlinear combination of the previous terms

B) A linear recurrence relation involves only one previous term, while a nonlinear recurrence relation involves multiple previous terms

C) A linear recurrence relation has a closed-form expression, while a nonlinear recurrence relation does not

D) A linear recurrence relation is always homogeneous, while a nonlinear recurrence relation can be non-homogeneous

Answer: A

32. Which of the following is an example of a nonlinear recurrence relation?

A) f(n) = 2f(n-1)

B) g(n) = g(n-1) + g(n-2)

C) h(n) = h(n-1)^2 + 1

D) i(n) = n^2 + 1

Answer: C

33. What is the solution of the recurrence relation f(n) = 3f(n-1) + 2 with initial condition f(0) = 1, using the generating function method?

A) f(n) = 3^n + 1

B) f(n) = 3^n - 1

C) f(n) = 3^n + 2

D) f(n) = 3^n - 2

Answer: D

34. What is the characteristic equation of the recurrence relation f(n) = 4f(n-1) - 4f(n-2) with initial conditions f(0) = 0 and f(1) = 1?

A) r^2 + 4r - 4 = 0

B) r^2 - 4r + 4 = 0

C) r^2 + 4r + 4 = 0

D) r^2 - 4r - 4 = 0

Answer: B

35. Which of the following is not an application of recurrence relations?

A) Counting problems

B) Data analysis

C) Time complexity analysis of algorithms

D) Modeling of physical phenomena

Answer: B

36. Which of the following is an example of a non-homogeneous linear recurrence relation with constant coefficients?

A) f(n) = 2f(n-1) - f(n-2) + n

B) g(n) = g(n-1) + g(n-2) + 1

C) h(n) = h(n-1)^2 + 1

D) i(n) = n^2 + 1

Answer: A

37. What is the order of a recurrence relation?

A) The number of terms in the sequence

B) The degree of the polynomial in the characteristic equation

C) The number of initial conditions required to uniquely determine the sequence

D) The maximum number of previous terms involved in the relation

Answer: D

38. What is the method of undetermined coefficients used for in the solution of non-homogeneous linear recurrence relations?

A) To find the general solution to the homogeneous recurrence relation

B) To find the particular solution to the non-homogeneous recurrence relation

C) To determine the order of the recurrence relation

D) To find the characteristic equation of the recurrence relation

Answer: B

39. Which of the following is an example of a non-linear non-homogeneous recurrence relation?

A) f(n) = f(n-1) + 2

B) g(n) = g(n-1)g(n-2)

C) h(n) = h(n-1) + n^2

D) i(n) = i(n-1)^2 + 1

Answer: B

40. Which of the following is the generating function for the sequence 1, 2, 4, 8, 16, ... ?

A) f(x) = 1/(1-x)

B) g(x) = 1/(1-2x)

C) h(x) = 1/(1-x^2)

D) i(x) = 1/(1-2x^2)

Answer: B

UNIT III COUNTING PRINCIPLES AND RELATIONS

41. Which principle of counting is used to find the number of elements in the union of two sets A and B when A and B have some elements in common?

A. Principle of Inclusion-Exclusion

B. Pigeonhole Principle

C. Generalized Pigeonhole Principle

D. None of the above

Answer: A. Principle of Inclusion-Exclusion

42. In how many ways can 5 books be arranged on a shelf if 2 of the books must always be together?

A. 60

B. 120

C. 240

D. 480

Answer: B. 120

43. What is the maximum number of pigeons that can be placed in 4 pigeonholes if each hole can hold at most 2 pigeons?

A. 4

B. 6

C. 8

D. 10

Answer: C. 8

44. Which principle is used when there are more pigeons than pigeonholes?

A. Principle of Inclusion-Exclusion

B. Pigeonhole Principle

C. Generalized Pigeonhole Principle

D. None of the above

Answer: C. Generalized Pigeonhole Principle

45. What is the minimum number of colors needed to color a map with 9 regions so that no two adjacent regions have the same color?

A. 2

B. 3

C. 4

D. 5

Answer: B. 3

46. Which of the following is a reflexive relation?

A. {(1,1), (2,2), (3,2)}

B. {(1,2), (2,3), (3,1)}

C. {(1,1), (1,2), (2,1)}

D. {(1,2), (2,1), (3,3)}

Answer: A. {(1,1), (2,2), (3,2)}

47. Which of the following is a transitive relation?

A. {(1,2), (2,3), (3,1)}

B. {(1,2), (2,3), (3,2)}

C. {(1,1), (1,2), (2,1)}

D. {(1,2), (2,1), (3,3)}

Answer: B. {(1,2), (2,3), (3,2)}

48. What is the composition of relations R = {(1,2), (2,3)} and S = {(2,4), (3,5)}?

A. {(1,4), (2,5)}

B. {(2,4), (2,5)}

C. {(2,2), (2,3), (3,4), (3,5)}

D. {(1,4), (3,5)}

Answer: D. {(1,4), (3,5)}

49. What is the matrix representation of the relation R = {(1,2), (2,3), (3,1)}?

A.

0 1 0

0 0 1

1 0 0

B.

1 0 0

0 1 0

0 0 1

C.

0 0 1

1 0 0

0 1 0

D.

1 1 0

0 1 1

1 0 1

Answer: C.

50. Which of the following is an example of an equivalence relation?

A. {(1,2), (2,3), (3,4)}

B. {(1,2), (2,3), (1,3)}

C. {(1,2), (2,3), (3,1)}

D. {(1,2), (3,4), (5,6)}

Answer: B. {(1,2), (2,3), (1,3)}

51. Which of the following is a partially ordered set?

A. {(1,2), (2,1), (2,3)}

B. {(1,2), (2,3), (3,4)}

C. {(1,1), (2,2), (3,3)}

D. {(1,2), (2,3), (3,1)}

Answer: B. {(1,2), (2,3), (3,4)}

52. Which of the following is a total ordering relation?

A. {(1,2), (2,1), (2,3)}

B. {(1,2), (2,3), (3,4)}

C. {(1,1), (2,2), (3,3)}

D. {(1,2), (2,1), (3,4)}

Answer: D. {(1,2), (2,1), (3,4)}

53. What is the Hasse diagram for the partially ordered set {(1,2), (2,3), (3,4)}?

A.

1 --- 2 --- 3 --- 4

B.

1 --- 2

|

3 --- 4

C.

1 --- 2 --- 3

|

4

D.

1 --- 2 --- 3

|

4

Answer: C.

1 --- 2 --- 3

|

4

54. What is the transitive closure of the relation R = {(1,2), (2,3)}?

A. {(1,2), (2,3)}

B. {(1,3), (1,2), (2,3)}

C. {(1,2), (2,3), (1,3)}

D. {(1,3)}

Answer: C. {(1,2), (2,3), (1,3)}

55. What is the reflexive closure of the relation R = {(1,2), (2,3)}?

A. {(1,2), (2,3)}

B. {(1,1), (2,2), (3,3), (1,2), (2,3)}

C. {(1,2), (2,3), (2,2)}

D. {(1,2), (2,3), (1,1), (3,3)}

Answer: B. {(1,1), (2,2), (3,3), (1,2), (2,3)}

56. Which of the following is an example of a sublattice of the lattice {(0,0), (0,1), (1,0), (1,1)}?

A. {(0,0), (0,1)}

B. {(0,0), (1,0)}

C. {(0,0), (1,1)}

D. {(1,0), (1,1)}

Answer: A. {(0,0), (0,1)}

57. Which of the following is a valid Hasse diagram for the lattice {(1,1), (1,2), (1,3), (2,3), (3,3)}?

A.

(1,1) --- (1,2) --- (1,3)

| |

(2,3) (3,3)

B.

(1,1) --- (1,2) --- (1,3)

|

(2,3)

|

(3,3)

C.

(1,1) --- (1,2) --- (1,3) --- (2,3) --- (3,3)

D.

(1,1) --- (1,2) --- (2,3) --- (1,3) --- (3,3)

Answer: A.

(1,1) --- (1,2) --- (1,3)

| |

(2,3) (3,3)

58. Which of the following is an example of a function that is not injective?

A. f(x) = x^2

B. f(x) = 2x + 1

C. f(x) = sin(x)

D. f(x) = |x|

Answer: A. f(x) = x^2

59. Which of the following is an example of a function that is not surjective?

A. f(x) = x^2

B. f(x) = 2x + 1

C. f(x) = sin(x)

D. f(x) = |x|

Answer: D. f(x) = |x|

60. Which of the following is true for a symmetric relation R?

A. R is always reflexive.

B. R is always transitive.

C. R is always irreflexive.

D. R is always antisymmetric.

Answer: B. R is always transitive.

UNIT IV GRAPH 1

61. Which of the following is not a special type of graph?

A) Complete graph

B) Cycle graph

C) Bipartite graph

D) Linear graph

Answer: D) Linear graph

62. Which of the following graphs is not a regular graph?

A) Complete graph

B) Cycle graph

C) Bipartite graph

D) Wheel graph

Answer: D) Wheel graph

63. What is a graph with n vertices and no edges called?

A) Null graph

B) Complete graph

C) Cycle graph

D) Regular graph

Answer: A) Null graph

64. In a complete graph with n vertices, how many edges are there?

A) n

B) n(n-1)/2

C) n(n+1)/2

D) n^2

Answer: B) n(n-1)/2

65. Which of the following is not a type of path?

A) Simple path

B) Closed path

C) Eulerian path

D) Hamiltonian path

Answer: B) Closed path

66. What is a graph that has no cycles called?

A) Connected graph

B) Disconnected graph

C) Tree

D) Spanning graph

Answer: C) Tree

67. Which of the following is not a type of cycle?

A) Simple cycle

B) Directed cycle

C) Eulerian cycle

D) Hamiltonian cycle

Answer: C) Eulerian cycle

68. What is the maximum number of edges in a bipartite graph with n vertices?

A) n-1

B) n

C) n(n-1)/2

D) n^2

Answer: D) n^2

69. Which of the following is a correct representation of a graph?

A) Adjacency matrix

B) Incidence matrix

C) Both A and B

D) Neither A nor B

Answer: C) Both A and B

70. What is the condition for two graphs to be isomorphic?

A) They must have the same number of vertices and edges.

B) They must have the same number of vertices and the same degree sequence.

C) They must have the same number of edges and the same degree sequence.

D) They must have the same degree sequence and the same adjacency matrix.

Answer: B) They must have the same number of vertices and the same degree sequence.

71. Which of the following is not a type of connectivity?

A) Strongly connected

B) Weakly connected

C) Semi-connected

D) Disconnected

Answer: C) Semi-connected

72. What is the shortest path between two vertices in a graph?

A) Simple path

B) Closed path

C) Eulerian path

D) Hamiltonian path

Answer: A) Simple path

73. What is the algorithm used to find the shortest path in a weighted graph?

A) Kruskal's algorithm

B) Prim's algorithm

C) Dijkstra's algorithm

D) Floyd-Warshall algorithm

Answer: C) Dijkstra's algorithm

74. What is the maximum number of edges in a simple graph with n vertices?

A) n-1

B) n

C) n(n-1)/2

D) n^2

Answer: C) n(n-1)/2

75. What is the minimum number of edges in a connected graph with n vertices?

A) n-1

B) n

C) n(n-1)/2

D) n(n+1)/2

Answer: A) n-1

76. What is the condition for a graph to be planar?

A) It must have no cycles.

B) It must have no vertices of degree 2.

C) It must not contain a subgraph that is isomorphic to K5 or K3,3.

D) It must have an Eulerian path.

Answer: C) It must not contain a subgraph that is isomorphic to K5 or K3,3.

77. What is a cut vertex in a graph?

A) A vertex that disconnects the graph when removed.

B) A vertex that is adjacent to every other vertex.

C) A vertex that has the same neighbors as another vertex.

D) A vertex that is part of a cycle.

Answer: A) A vertex that disconnects the graph when removed.

78. What is a clique in a graph?

A) A subgraph that is isomorphic to a complete graph.

B) A subgraph that is isomorphic to a cycle graph.

C) A subgraph that is isomorphic to a bipartite graph.

D) A subgraph that is isomorphic to a regular graph.

Answer: A) A subgraph that is isomorphic to a complete graph.

79. What is the chromatic number of a graph?

A) The number of edges in the graph.

B) The minimum number of colors needed to color the vertices of the graph such that no adjacent vertices have the same color.

C) The maximum number of colors needed to color the vertices of the graph.

D) The number of connected components in the graph.

Answer: B) The minimum number of colors needed to color the vertices of the graph such that no adjacent vertices have the same color.

80. What is the Euler characteristic of a graph?

A) The sum of the degrees of all vertices in the graph.

B) The number of edges in the graph.

C) The number of connected components in the graph.

D) The difference between the number of vertices and the number of edges in the graph.

Answer: D) The difference between the number of vertices and the number of edges in the graph.

UNIT V GRAPH THEORY 2

81. Which of the following is a characteristic of planar graphs?

a) Every edge is connected to exactly two vertices

b) Every vertex has an even degree

c) There are no cycles of odd length

d) They can be drawn on a flat surface without any edges crossing

Answer: d) They can be drawn on a flat surface without any edges crossing

82. What is the Euler formula for planar graphs?

a) V - E + F = 1

b) V + E = F + 2

c) E - V + F = 2

d) V + E - F = 1

Answer: c) E - V + F = 2

83. In a graph, what is the chromatic number?

a) The number of edges in a spanning tree

b) The minimum number of colors needed to color the vertices

c) The maximum number of edges in a tree graph

d) The number of connected components in a graph

Answer: b) The minimum number of colors needed to color the vertices

84. What is a tree graph?

a) A graph with no cycles

b) A graph with a single vertex

c) A graph with only two vertices

d) A graph with only three vertices

Answer: a) A graph with no cycles

85. What is a rooted tree?

a) A tree graph with a designated root node

b) A tree graph with all nodes having the same degree

c) A tree graph with only two nodes

d) A tree graph with only three nodes

Answer: a) A tree graph with a designated root node

86. What is a spanning tree?

a) A tree graph that includes all the vertices of the original graph

b) A tree graph with the minimum possible number of edges

c) A tree graph with the maximum possible number of edges

d) A tree graph with a designated root node

Answer: a) A tree graph that includes all the vertices of the original graph

87. What is a minimum spanning tree?

a) A spanning tree with the minimum possible number of edges

b) A spanning tree with the maximum possible number of edges

c) A spanning tree with a designated root node

d) A tree graph that includes all the vertices of the original graph

Answer: a) A spanning tree with the minimum possible number of edges

88. What is a decision tree?

a) A tree graph used for making decisions

b) A tree graph with only two nodes

c) A tree graph with all nodes having the same degree

d) A tree graph that includes all the vertices of the original graph

Answer: a) A tree graph used for making decisions

89. Which of the following is a way to represent mathematical expressions using a tree graph?

a) Infix notation

b) Prefix notation

c) Postfix notation

d) All of the above

Answer: d) All of the above

90. What is infix notation?

a) A way to represent mathematical expressions using a tree graph

b) A way to represent mathematical expressions using parentheses

c) A way to represent mathematical expressions using operators before operands

d) A way to represent mathematical expressions using operators after operands

Answer: b) A way to represent mathematical expressions using parentheses

91. What is prefix notation?

a) A way to represent mathematical expressions using a tree graph

b) A way to represent mathematical expressions using parentheses

c) A way to represent mathematical expressions using operators before operands

d) A way to represent mathematical expressions using operators after operands

Answer: c) A way to represent mathematical expressions using operators before operands

92. What is graph coloring?

a) Assigning colors to vertices in a graph such that no two adjacent vertices have the same color

b) Assigning colors to edges in a graph such that no two adjacent edges have the same color

c) Assigning colors to vertices and edges in a graph such that no two adjacent vertices or edges have the same color

d) Assigning colors to vertices in a graph such that every vertex has the same color

Answer: a) Assigning colors to vertices in a graph such that no two adjacent vertices have the same color

93. What is the chromatic number of a complete graph with n vertices?

a) n

b) n-1

c) 2n

d) 2^(n-1)

Answer: a) n

94. What is a bipartite graph?

a) A graph in which every vertex has degree 2

b) A graph in which every vertex has degree 3

c) A graph that can be split into two sets of vertices such that there are no edges between vertices in the same set

d) A graph that can be split into two sets of vertices such that there are no edges between vertices in different sets

Answer: d) A graph that can be split into two sets of vertices such that there are no edges between vertices in different sets

95. What is a Hamiltonian path?

a) A path that visits every vertex in a graph exactly once

b) A path that visits every edge in a graph exactly once

c) A path that visits every vertex in a graph at least once

d) A path that visits every edge in a graph at least once

Answer: a) A path that visits every vertex in a graph exactly once

96. What is a Hamiltonian cycle?

a) A cycle that visits every vertex in a graph exactly once

b) A cycle that visits every edge in a graph exactly once

c) A cycle that visits every vertex in a graph at least once

d) A cycle that visits every edge in a graph at least once

Answer: a) A cycle that visits every vertex in a graph exactly once

97. What is a planar embedding?

a) A way of drawing a planar graph on a surface without any edge crossings

b) A way of coloring the vertices of a planar graph using the fewest number of colors possible

c) A way of finding the shortest path between two vertices in a graph

d) A way of finding the minimum spanning tree of a graph

Answer: a) A way of drawing a planar graph on a surface without any edge crossings

98. What is the genus of a graph?

a) The number of vertices in the graph

b) The number of edges in the graph

c) A measure of how many holes a graph has

d) A measure of how dense a graph is

Answer: c) A measure of how many holes a graph has

99. What is the dual of a planar graph?

a) A graph that has the same number of vertices and edges as the original graph

b) A graph that is obtained by flipping the original graph over

c) A graph that is obtained by replacing each face of the original graph with a vertex and connecting vertices that correspond to adjacent faces

d) A graph that is obtained by removing all edges from the original graph

Answer: c) A graph that is obtained by replacing each face of the original graph with a vertex and connecting vertices that correspond to adjacent faces

100. What is a clique in a graph?

a) A set of vertices that are not connected by any edges

b) A set of vertices that are all connected to a single vertex

c) A set of vertices that are all pairwise connected by edges

d) A set of edges that form a closed loop in the graph

Answer: c) A set of vertices that are all pairwise connected by edges.

UNIT VI NUMBER THEORY AND IT'S APPLICATION IN CRYPTOGRAPHY

101. Which of the following is not a property of modular arithmetic?

A) Commutativity

B) Associativity

C) Distributivity

D) Transitivity

Answer: D) Transitivity

102. What is the remainder when 1001 is divided by 7?

A) 0

B) 1

C) 2

D) 3

Answer: D) 3

103. Which of the following is not true for a prime number?

A) It is divisible by itself and 1 only

B) It is an odd number

C) It is a natural number

D) It has no positive divisors other than 1 and itself

Answer: B) It is an odd number

104. Which of the following is not a prime number?

A) 2

B) 3

C) 5

D) 6

Answer: D) 6

105. What is the greatest common divisor of 36 and 48?

A) 4

B) 6

C) 12

D) 18

Answer: C) 12

106. What is the least common multiple of 12 and 18?

A) 18

B) 36

C) 54

D) 72

Answer: B) 36

107. What is the result of applying the Euclidean algorithm to 48 and 60?

A) 12

B) 24

C) 36

D) 48

Answer: A) 12

108. What is Bezout's lemma?

A) It states that every integer can be expressed as a sum of two other integers

B) It states that every prime number has a unique factorization

C) It states that for any two integers a and b, their greatest common divisor can be expressed as a linear combination of a and b

D) It states that for any two integers a and b, their least common multiple can be expressed as a linear combination of a and b

Answer: C) It states that for any two integers a and b, their greatest common divisor can be expressed as a linear combination of a and b

109. What is a linear congruence?

A) An equation of the form ax^2 + bx + c = 0

B) An equation of the form ax + b ≡ 0 (mod m)

C) An equation of the form ax ≡ b (mod m)

D) An equation of the form a ≡ b (mod m)

Answer: C) An equation of the form ax ≡ b (mod m)

110. What is the inverse of 7 modulo 11?

A) 2

B) 3

C) 7

D) 9

Answer: B) 3

111. What is the Chinese remainder theorem?

A) It states that for any two integers a and b, their greatest common divisor can be expressed as a linear combination of a and b

B) It states that for any two integers a and b, their least common multiple can be expressed as a linear combination of a and b

C) It provides a way to solve systems of linear congruences

D) It provides a way to calculate the inverse of a number modulo m

Answer: C) It provides a way to solve systems of linear congruences

112. What is the encryption method used by the Ceasar cipher?

A) Substitution

B) Transposition

C) Permutation

D) Multiplication

Answer: A) Substitution

113. What is the affine transformation used for in cryptography?

A) Encryption

B) Decryption

C) Key generation

D) Digital signatures

Answer: A) Encryption

114. What is Fermat's little theorem?

A) It states that if p is a prime number and a is any integer, then a^p ≡ a (mod p)

B) It states that if p is a prime number and a is any integer not divisible by p, then a^(p-1) ≡ 1 (mod p)

C) It provides a way to calculate the greatest common divisor of two integers

D) It provides a way to calculate the inverse of a number modulo m

Answer: B) It states that if p is a prime number and a is any integer not divisible by p, then a^(p-1) ≡ 1 (mod p)

115. Which of the following is a property of modular arithmetic?

A) Commutativity

B) Associativity

C) Distributivity

D) All of the above

Answer: D) All of the above

116. What is a prime factorization?

A) The process of finding the greatest common divisor of two integers

B) The process of finding the least common multiple of two integers

C) The process of expressing a number as a product of prime numbers

D) The process of expressing a number as a sum of two other numbers

Answer: C) The process of expressing a number as a product of prime numbers

117. What is the result of applying the Euclidean algorithm to 24 and 36?

A) 6

B) 12

C) 18

D) 24

Answer: A) 6

118. What is the greatest common divisor of 40 and 56?

A) 4

B) 8

C) 16

D) 24

Answer: B) 8

119. What is the least common multiple of 6 and 15?

A) 6

B) 15

C) 30

D) 60

Answer: C) 30

120. What is a modular inverse?

A) The inverse of a number modulo m

B) The inverse of a number modulo p

C) The inverse of a number modulo q

D) The inverse of a number modulo r

Answer: A) The inverse of a number modulo m.