Subject Name & Code : Discrete Mathematics & Graph Theory (23BS301D) Exam Name : Q1

1. Which of the following propositions is a tautology? [C]

A) (p V q) → q B) p V (q → p) C) p V (p → q) D) p ↔ q

2. The proposition p (¬p V q) is [C]

A) A tautology B) A contradiction C) Logically equivalent to p q D) Contingency

3. Which of the following is tautology? [B]

A) (a V b) → (b c) B) (a b) → (b V c) C) (a V b) → (b → c) D) (a → b) (b → c)

4. Identify the valid conclusion from the premises p V q, q→r, p→m, ¬m [C]

A) p (r V q) B) p (p r) C) r (p V q) D) q (p V r)

5. Which of the following is a declarative statement? [B]

A) It's right. B) The sun rises in the west. C) What a beautiful flower it is? D) I love you.

6. p → (q→ r) is equivalent to [A]

A) (p q) → r B) (p V q) → r C) (p q) → ¬r D) (p V q) →¬r

7. Which of the following is not a tautology? [D]

A) {(p V q) q} ↔ q B) {(p V q) p} → p C) {(p q) V p} → p D) {(p q) V p} → q

8. Consider two well-formed formulas in propositional logic : F1: P⇒¬P, F2: (P⇒¬P)∨(¬P⇒P) Which of the following statements is correct? [A]

A) F1 is satisfiable, F2 is valid B) F1 is unsatisfiable, F2 is satisfiable C) F1 is unsatisfiable, F2 is valid D) F1 and F2 are both satisfiable

9. Which of the following is equivalent to (p V ¬p) (q →r) (¬r) [D]

A) q B) r C) ¬q D) ¬(q V r)

10. Which of the following inference is obtained from (p V q) (p → r) (q → s) [B]

A) s → r B) s v r C) s ↔ r D) none of the mentioned

11. The functionally complete set is [C]

A) { } B) { V } C) {¬, } D) {V , }

12. ¬(p → q) is equivalent to [D]

A) ¬p → q B) p → ¬q C) ¬p → ¬q D) p ¬q

13. In propositional logic, which of the following is equivalent to p → q? [B]

A) ¬p → q B) ¬p V q C) ¬p V ¬q D) p → ¬q

14. Which of the following is equivalent to (p V q) (p → r) (q → s)? [D]

A) s → r B) s v r C) s ↔ r D) none of the mentioned

15. Which rule of inference is used in each of these arguments, “If it hails today, the local office will be closed. The local office is not closed today. Thus, it did not hailed today.” [A]

A) Modus tollens B) Conjunction C) Hypothetical syllogism D) Simplification

16. P Q have the truth value T whenever both P and Q have the truth value [A]

A) T, T B) T, F C) F ,T D) F, F

17. P V Q have the truth value F whenever both P and Q have the truth value [D]

A) T, T B) T, F C) F ,T D) F, F

18. ¬(P Q) have the truth value F whenever both P and Q have the truth value [A]

A) T, T B) T, F C) F ,T D) F, F

19. P → Q has the truth value F whenever P and Q have the truth value [B]

A) T, T B) T, F C) F ,T D) F, F

20. The converse of P → Q [A]

A) Q → P B) ¬Q → ¬P C) ¬P → ¬Q D) ¬Q → P

21. The inverse of P → Q [C]

A) Q → P B) ¬Q → ¬P C) ¬P → ¬Q D) ¬Q → P

22. The contra positive of P → Q [B]

A) Q → P B) ¬Q → ¬P C) ¬P → ¬Q D) ¬Q → P

23. If A: p → q and B: ¬q → ¬p then which of the following is true? [D]

A) A logically implies B B) B logically implies A C) A is equivalent to B D) All of the mentioned

24. p ↔ q has the truth value T whenever P and Q have the truth value [A]

A) F, F B) T, F C) F ,T D) none of the mentioned

25. p ↔ q and (p → q) (q → p) are [A]

A) Equivalent B) Dual C) Tautological D) none of the mentioned

26. P ¬P is always [B]

A) T B) F C) P D) ¬ P

27. P V ¬P is always [A]

A) T B) F C) P D) ¬ P

28. (p V q) → p is a [B]

A) Tautology B) Contingency C) Contradiction D) Equivalent

29. {p (p ↔ q)} → q is a [A]

A) Tautology B) Contingency C) Contradiction D) Equivalent

30. If A ↔ B is a tautology, then A and B are [A]

A) Equivalent B) Tautological C) Contradiction D) none of the mentioned

31. If A → B is a tautology, then A and B are [D]

A) Equivalent B) Tautological C) Contradiction D) none of the mentioned

32. The dual of p (¬q V r) is [A]

A) p V (¬q r) B) ¬p V (q ¬r) C) ¬p (q V ¬r) D) none of the mentioned

33. The dual of p ¬(q V r) ≡ p (¬q ¬r) [C]

A) p V ¬(q V r) ≡ p V (¬q ¬r) B) p ¬(q r) ≡ p (¬q V ¬r) C) p V ¬(q r) ≡ p V (¬q V ¬r) D) none of the mentioned

34. The dual of (p q) V ¬r V F ≡ (p V ¬r) (q V ¬r) V F [B]

A) (p V q) ¬r F ≡ (p ¬r) V (q ¬r) F B) (p V q) ¬r T ≡ (p ¬r) V (q ¬r) T C) (p V q) ¬r V F ≡ (p ¬r) V (q ¬r) V F D) (p V q) ¬r V T ≡ (p ¬r) V (q ¬r) V T

35. Identify the valid conclusion from the premises P → Q, Q →R and P [A]

A) R B) P C) Q D) ¬R

36. PDNF is the [A]

A) Disjunctions of min terms B) Disjunctions of max terms C) Conjunctions of min terms D) Conjunctions of max terms

37. PCNF is the [D]

A) Disjunctions of min terms B) Disjunctions of max terms C) Conjunctions of min terms D) Conjunctions of max terms

38. DNF is the [B]

A) Product of elementary sums B) Sum of elementary products C) Disjunctions of min terms D) Conjunctions of max terms

39. CNF is the [A]

A) Product of elementary sums B) Sum of elementary products C) Disjunctions of min terms D) Conjunctions of max terms

40. The connective ↑ is not [A]

A) associative B) commutative C) functionally complete set D) none of the mentioned

41. P⊕Q has the truth value F whenever P and Q have the truth value [B]

A) T, F B) T, T C) F ,T D) none of the mentioned

42. $P \uparrow Q \Leftrightarrow$ [A]

A) $\neg(P \wedge Q)$ B) ¬(P V Q) C) P ? ¬Q D) P V ¬Q

43. $P \downarrow Q \Leftrightarrow$ [B]

A) ¬(P Q) B) ¬(P V Q) C) P ¬Q D) P V ¬Q

44. $(P \wedge \neg P)$ is a [C]

A) Tautology B) Contingency C) Contradiction D) None

45. $P \vee (P \wedge Q) \Leftrightarrow$ [B]

A) Q B) P C) ¬ P D) ¬ Q

46. Which of the following is a minterm? [A]

A) $P \wedge \neg Q \wedge R$ B) P V ¬Q V R C) P ? ¬Q ? ¬P D) P V Q V ¬Q

47. Which of the following is a maxterm? [B]

A) P ¬Q R B) P V ¬Q V R C) P ¬Q ¬P D) P V Q V ¬Q

48. Which of the following is NOT a declarative statement? [C]

A) 5 + 2 = 7 B) 2 – 3 = 1 C) Close the door D) Delhi is the capital of India.

49. $(P \wedge \neg P)$ is a [C]

A) Tautology B) Contingency C) Contradiction D) none of the mentioned

50. Which of the following statement is a proposition? [D]

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

51. Which of the following option is true? [A]

A) If the Sun is a planet, elephants will fly B) 3 + 2 = 8 if 5 – 2 = 3 C) 1 > 3 and 3 is a positive integer D) – 2 > 3 or 3 is a negative integer

52. 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' [C]

A) 1 B) 3 C) 0 D) 2

53. Let P: I am in Bangalore.; Q: I love cricket.; then q → p(q implies p) is? [A]

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

54. 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? [C]

A) Raju bowled and Sahil got out on first ball B) Raju did not bowled C) Sahil bowled andSaurabh hits a century D) Sahil bowled and Saurabh got out

55. 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? [B]

A) ~P V ~Q B) P ~Q C) P V Q D) P Q

56. Let P (x) denote the statement "x > 7." Which of these have truth value true? [D]

A) P(0) B) P(4) C) P(6) D) P(9)

57. Let P (x) denote the statement "x is less than or equal to 5." Which of these have truth value false? [C]

A) P(0) B) P(5) C) ∀x P(x) D) ∃x P(x)

58. The statement, "Every comedian is funny" where C(x) is "x is a comedian" and F (x) is "x is funny", is best represented by? [D]

A) ∃x (C(x) F(x)) B) ∀x (C(x) F(x)) C) ∃x (C(x) → F(x)) D) ∀x (C(x) → F(x))

59. The statement, "At least one of your friends is perfect". Let P (x) be "x is perfect" and let F (x) be "x is your friend" is best represented by? [A]

A) ∃x (F(x) P(x)) B) ∀x (F(x) P(x)) C) ∃x (F(x) → P(x)) D) ∀x (F(x) → P(x))

60. Which rule of inference is used, ”Bhavika will work in an enterprise this summer. Therefore, this summer Bhavika will work in an enterprise or he will go to beach.” [C]

A) Simplification B) Conjunction C) Addition D) Disjunctive syllogism

61. Let domain of m includes all students, P (m) be the statement “m spends more than 2 hours in playing polo”. Express ∀m ¬P (m) quantification in English. [D]

A) A student is there who spends more than 2 hours in playing polo B) There is a student who does not spend more than 2 hours in playing polo C) All students spends more than 2 hours in playing polo D) No student spends more than 2 hours in playing polo

62. The compound propositions p and q are called logically equivalent if _____ is a tautology. [A]

A) $p \leftrightarrow q$ B) $p \rightarrow q$ C) $\neg (p \vee q)$ D) $\neg p \vee \neg q$

63. Which of the following is false for a predicate? [D]

A) A predicate is not a proposition B) A predicate becomes a proposition by authorizing values to the variables in it C) A predicate becomes a proposition by quantifying variables in it D) None of the mentioned

64. The statement ∀x P(x) is true iff [A]

A) P(c) is true for all values of c B) P(c) is true for at least one value of c C) P(c) is false for all values of c D) P(c) is false for at least one value of c

65. The statement ∃x P(x) is true iff [B]

A) P(c) is true for all values of c B) P(c) is true for at least one value of c C) P(c) is false for all values of c D) P(c) is false for at least one value of c

66. The statement ∀x P(x) is false iff [D]

A) P(c) is true for all values of c B) P(c) is true for at least one value of c C) P(c) is false for all values of c D) P(c) is false for at least one value of c

67. The statement ∃x P(x) is false iff [C]

A) P(c) is true for all values of c B) P(c) is true for at least one value of c C) P(c) is false for all values of c D) P(c) is false for at least one value of c

68. What is the converse of the conditional statement “If it ices today, I will play ice hockey tomorrow.” [A]

A) “I will play ice hockey tomorrow only if it ices today.” B) “If I do not play ice hockey tomorrow, then it will not have iced today.” C) “If it does not ice today, then I will not play ice hockey tomorrow.” D) “I will not play ice hockey tomorrow only if it ices today.”

69. What is the contrapositive of the conditional statement “I come to class whenever there is going to be a test.” [B]

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.”

70. What is the converse of the conditional statement “ A positive integer is a composite only if it has divisors other than 1 and itself.” [A]

A) “A positive integer is a composite if it has divisors other than 1 and itself.” B) “If a positive integer has no divisors other than 1 and itself, then it is not composite.” C) “If a positive integer is not composite, then it has no divisors other than 1 and itself.” D) None of the mentioned

71. What is the inverse of the conditional statement “ A positive integer is a composite only if it has divisors other than 1 and itself.” [C]

A) “A positive integer is a composite if it has divisors other than 1 and itself.” B) “If a positive integer has no divisors other than 1 and itself, then it is not composite.” C) “If a positive integer is not composite, then it has no divisors other than 1 and itself.” D) None of the mentioned

72. What are the converse of the conditional statement “When Raj stay up late, it is necessary that Raj sleep until noon.” [D]

A) “If Raj stay up late, then Raj sleep until noon.” B) “If Raj does not stay up late, then Raj does not sleep until noon.” C) “If Raj does not sleep until noon, then Raj does not stay up late.” D) “If Raj sleep until noon, then Raj stay up late.”

73. What are the inverse of the conditional statement “If you make your notes, it will be a convenient in exams.” [B]

A) “If you make notes, then it will be a convenient in exams.” B) “If you do not make notes, then it will not be a convenient in exams.” C) “If it will not be a convenient in exams, then you did not make your notes.” D) “If it will be a convenient in exams, then you make your notes

74. Which of the following statements is the negation of the statements “4 is odd or –9 is positive”? [C]

A) 4 is even or – 9 is not negative B) 4 is odd or –9 is not negative C) 4 is even and –9 is negative D) 4 is odd and – 9 is not negative

75. Which of the following represents: ~A (negation of A) if A stands for “I like badminton but hate maths”? [D]

A) I hate badminton and maths B) I do not like badminton or maths C) I dislike badminton but love maths D) I hate badminton or like maths

76. Consider the following well formed formulae I. $\sim\forall x P(x)$ II. $\sim\exists x P(x)$ III. $\sim\exists x \sim P(x)$ IV. $\exists x \sim P(x)$ [B]

A) I and III B) I and IV C) II and III D) II and IV

77. Let Graph(x) be a predicate which denotes that x is a graph. Let Connected(x) be a predicate which denotes that x is connected. Which of the following first order logic sentences DOES NOT represent the statement: "Not every graph is connected"? [D]

A) $\neg\forall x(Graph(x) \Rightarrow Connected(x))$ B) $\exists x(Graph(x) \wedge \neg Connected(x))$ C) $\neg\forall x(\neg Graph(x) \vee Connected(x))$ D) $\forall x(Graph(x) \Rightarrow \neg Connected(x))$

78. Which one of the following is the most appropriate logical formula to represent the statement: "Gold and silver ornaments are precious" The following notations are used: [D]
G(x): x is a gold ornament
S(x): x is a silver ornament
P(x): x is precious

A) $\forall x(P(x)\rightarrow(G(x)\wedge S(x)))$ B) $\forall x(G(x)\wedge(S(x)\rightarrow P(x)))$ C) $\exists x((G(x)\wedge S(x))\rightarrow P(x))$ D) $\forall x((G(x)\vee S(x))\rightarrow P(x))$

79. Which one of the first order predicate calculus statements given below correctly expresses the following English statement? [D]
"Tigers and lions attack if they are hungry or threatened".

A) $\forall x[(tiger(x) \wedge lion(x)) \rightarrow \{(hungry(x) \vee threatened(x)) \rightarrow attacks(x)\}]$ B) $\forall x[(tiger(x) \vee lion(x)) \rightarrow \{(hungry(x) \vee threatened(x)) \wedge attacks(x)\}]$ C) $\forall x[(tiger(x) \vee lion(x)) \rightarrow \{attacks(x) \rightarrow (hungry(x) \vee threatened(x))\}]$ D) $\forall x[(tiger(x) \vee lion(x)) \rightarrow \{(hungry(x) \vee threatened(x)) \rightarrow attacks(x)\}]$

80. Negation of $\forall x \{ [L(x) \vee T(x)] \rightarrow D(x) \}$ [D]

A) $\forall x [L(x) \vee T(x) \vee D(x)]$ B) $\forall x [\{L(x) \vee T(x)\} \wedge D(x)]$ C) $\exists x [\{L(x) \vee T(x)\} \wedge D(x)]$ D) $\exists x [\{L(x) \vee T(x)\} \wedge \sim D(x)\}$

81. Which of the following is false? [A]

A) $\forall x\ P(x) \Leftrightarrow \exists x\ P(x)$ B) $\sim\forall x \sim P(x) \Leftrightarrow \exists x\ P(x)$ C) $\forall x\ P(x) \Leftrightarrow \sim\exists x \sim P(x)$ D) $\sim\forall x\ P(x) \Leftrightarrow \exists x \sim P(x)$

82. Which of the following is false? [C]

A) $\forall x [P(x) \wedge Q(x)] \Rightarrow [\forall x P(x)] \wedge [\forall x Q(x)]$ B) $\exists x [P(x) \vee Q(x)] \Rightarrow [\exists x P(x)] \vee [\exists x Q(x)]$ C) $\forall x [P(x) \vee Q(x)] \Rightarrow [\forall x\ P(x)] \vee [\forall x\ Q(x)]$ D) $\exists x [P(x) \wedge Q(x)] \Rightarrow [\exists x P(x)] \wedge [\exists x Q(x)]$

83. {x: x is an integer neither positive nor negative} is _____ [D]

A) Empty set B) Non–Empty set C) Finite set D) Non–Empty and finite set

84. {x: x is a real number between 1 and 2} is an _____ [A]

A) Infinite set B) Finite set C) Empty set D) None of the mentioned

85. Write set {1, 5, 15, 25,…} in set–builder form. [C]

A) {x: either x = 1 or x = 5n, where n is a real number} B) {x: either x = 1 or x = 5n, where n is a integer} C) {x: either x = 1 or x = 5n, where n is an odd natural number} D) {x: x = 5n, where n is a natural number}

86. Express {x: x = n/ (n + 1), n is a natural number less than 7} in roster form. [C]

A) {1/2, 2/3, 4/5, 6/7} B) {1/2, 2/3, 3/4, 4/5, 5/6, 6/7, 7/8} C) {1/2, 2/3, 3/4, 4/5, 5/6, 6/7} D) Infinite set

87. Number of elements of power set of {a, b, {a,b}}, where a and b are distinct elements is [C]

A) 3 B) 4 C) 8 D) 16

88. Which of the following is a subset of set {1, {2, 3}, 4}? [D]

A) {1, 2} B) {2, 3} C) {1, 2, 3, 4} D) None of the mentioned

89. A = {∅, {∅}, 2, {3, ∅}}, which of the following is false? [C]

A) ∅ ∈ A B) ∅ ⊂ A C) {3, ∅} ⊂ A D) 2 ∈ A

90. Subset of the set A = { } is? [D]

A) A B) { } C) ∅ D) All the mentioned

91. Convert set {x: x is a positive prime number which divides 72} in roster form. [C]

A) {2, 3, 5} B) {2, 3, 6} C) {2, 3} D) {8, 9}

92. A _____ is well defined collection of objects. [C]

A) Relation B) Function set C) Set D) Proposition

93. The number of elements of Power set of empty set is ___ [A]

A) One B) Two C) Zero D) Three

94. What is the Cartesian product of A = {1, 2} and B = {a, b}? [C]

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)}

95. What is the cardinality of the set of odd positive integers less than 10? [B]

A) 10 B) 5 C) 3 D) 20

96. Which of the following two sets are equal? [C]

A) A = {1, 2} and B = {1, 2, 3} B) A = {1, 2, 3} and B = {1, {2, 3}} C) A = {1, 1, 2} and B = {1, 2, 2} D) A = {1, 2, { }} and B = {1, 2}

97. Two sets are called disjoint if their _____ is the empty set. [C]

A) Union B) Difference C) Intersection D) Complement

98. Which of the following two sets are disjoint? [D]

A) {1, 3, 5} and {1, 3, 6} B) {1, 2, 3} and {1, 2, 3} C) {1, 3, 5} and {2, 3, 4} D) {1, 3, 5} and {2, 4, 6}

99. The set difference of the set A with null set is _____ [A]

A) A B) null C) U D) B

100. Let the set A is {1, 2, 3} and B is {2, 3, 4}. Then the set A – B is? [C]

A) {1, –4} B) {1, 2, 3} C) {1} D) {2, 3}

101. In which of the following sets A – B is equal to B – A? [C]

A) A = {1, 2, 3}, B = {2, 3, 4} B) A = {1, 2, 3}, B = {1, 2, 3, 4} C) A = {1, 2, 2, 3}, B = {2, 3, 3, 3, 1} D) A = {1, 2}, B = { }

102. If A has 4 elements and B has 8 elements then the minimum and maximum number of elements in A U B are _____ [B]

A) 4,8 B) 8,12 C) 4,12 D) None of the mentioned

103. If n(A) = 10, n(B) = 30, n(C) = 50 and if set A, B, C are pairwise disjoint then which of the following is correct? [C]

A) n(A U B) = 0 B) n(B U C) = 0 C) n(A U B U C) = 90 D) All of the mentioned

104. Let the students who likes table tennis be 12, the ones who like lawn tennis 10, those who like only table tennis are 6, then number of students who likes only lawn tennis are, assuming there are total of 16 students. [C]

A) 16 B) 8 C) 4 D) 10

105. If set C is {1, 2, 3, 4} and C – D = Φ then set D can be _____ [C]

A) {1, 2, 4, 5} B) {1, 2, 3} C) {1, 2, 3, 4, 5} D) None of the mentioned

106. Let C and D be two sets then C – D is equivalent to _____ [C]

A) C' ∩ D B) C'∩ D' C) C ∩ D' D) None of the mentioned

107. Which of the following statement regarding sets is false? [D]

A) $A \cap A = A$ B) $A \cup A = A$ C) $A - (B \cap C) = (A - B) \cup (A - C)$ D) $(A \cup B)' = A' \cup B'$

108. If $C' \cup (D \cap E')$ is equivalent to _____ [C]

A) $(C \cap (D \cup E))'$ B) $(C \cap (D \cap E'))'$ C) $(C \cap (D' \cup E))'$ D) $(C \cup (D \cap E')'$

109. How many binary relations are there on a set S with 9 distinct elements? [C]

A) 2^{90} B) 2^{100} C) 2^{81} D) 2^{60}

110. _____ number of reflexive relations are there on a set of 11 distinct elements. [A]

A) 2^{110} B) 2^{121} C) 2^{66} D) 2^{55}

111. The number of reflexive as well as symmetric relations on a set with 14 distinct elements is _____ [A]

A) 2^{91} B) 2^{98} C) 2^{105} D) 3^{91}

112. The number of symmetric relations on a set with 15 distinct elements is _____ [C]

A) 3^{120} B) 2^{105} C) 2^{120} D) 3^{105}

113. Suppose S is a finite set with 7 elements. How many elements are there in the largest equivalence relation on S? [B]

A) 42 B) 49 C) 56 D) 126

114. If a set A has 8 elements and a set B has 10 elements, how many relations are there from A to B? [C]

A) 2^{40} B) 3^{40} C) 2^{80} D) 3^{80}

115. R is a binary relation on a set S and R is reflexive if and only if _____ [A]

A) (a,a) R for all a S B) (a,a) R for some a S C) R is subset of SxS D) R = SxS

116. R is a binary relation on a set S and R is symmetric if and only if _____ [C]

A) (a,a) R for all a S B) (a,a) R for some a S C) $R^{-1} = R$ D) R^{-1} R = SxS

117. The symmetric closure of a binary relation R on a set S is _____ [B]

A) R^{-1} B) $R\ R^{-1}$ C) $R\ R^{-1}$ D) RR^{-1}

118. The transitive closure of a binary relation R on a set S is _____ [D]

A) R ? R?¹ B) R ? R?¹ C) R ? R² D) $R \cup R^2 \cup R^3 \cup \cdots\cdots$

119. The reflexive closure of the relation {(1,1), (1,2), (2,2), (3,4), (4,3)} on the set {1, 2, 3, 4, 5} is _____ [D]

A) {(1,1), (2,2), (3,3), (4,4)} B) {(1,1), (2,2), (3,3), (4,4), (5,5)} C) {(1,1), (1,2), (2,2), (3,4), (4,3), (3,3), (4,4)} D) {(1,1), (1,2), (2,2), (3,4), (4,3), (3,3), (4,4), (5,5)}

120. The transitive closure of the relation {(2,1), (1,2), (2,2), (1,3)} on the set {1, 2, 3, 4} is _____ [B]

A) {(2,1), (1,2), (2,2), (1,3), (2,3)} B) {(2,1), (1,2), (2,2), (1,3), (2,3), (1,1)} C) {(2,1), (1,2), (2,2), (1,3), (2,3), (1,1), (3,3)} D) {(2,1), (1,2), (2,2), (1,3), (2,3), (1,1), (3,3), (4,4)}

121. A relation R is compatible iff R is _____ [A]

A) R is reflexive and symmetric B) R is reflexive and anti-symmetric C) R is symmetric and transitive D) R is reflexive, symmetric and transitive

122. Which of the following can be false for an equivalence relation R? [C]

A) R is reflexive B) R is symmetric C) R is anti-symmetric D) R is transitive

123. Which of the following can be false for a partial order relation R? [B]

A) R is reflexive B) R is symmetric C) R is anti-symmetric D) R is transitive

124. The number of elements in the largest equivalence relation of the set {3, 6, 9, 12, 18} is _____ [B]

A) 5 B) 25 C) 32 D) 125

125. The number of elements in the smallest equivalence relation of the set {3, 6, 9, 12, 18} is _____ [A]

A) 5 B) 25 C) 32 D) 125

126. If R_1 and R_2 are equivalence relations on a set A then R_1R_2 is _____ [B]

A) Compatible relation B) Equivalence relation C) Partial order relation D) None of the mentioned

127. If R_1 and R_2 are equivalence relations on a set A then R_1R_2 is _____ [A]

A) Compatible relation B) Equivalence relation C) Partial order relation D) None of the mentioned

128. The binary relation U = Φ (empty set) on a set A = {11, 23, 35} is _____ [D]

A) Neither reflexive nor symmetric B) Symmetric and reflexive C) Transitive and reflexive D) Transitive and symmetric

129. The binary relation {(1,1), (2,1), (2,2), (2,3), (2,4), (3,1), (3,2)} on the set {1, 2, 3} is _____ [C]

A) reflexive, symmetric and transitive B) irreflexive, symmetric and transitive C) neither reflexive nor irreflexive D) irreflexive and antisymmetric

130. Consider the relation: R' (x, y) if and only if x – y > 0 over the set of non–zero rational numbers, then R' is _____ [D]

A) Reflexive B) Neither symmetric nor assymmetric C) Neither symmetric nor anti-symmetric D) transitive and asymmetry relation

131. Consider the binary relation, A = {(a, b) | b = a – 1 and a, b belong to {1, 2, 3}}. The reflexive transitive closure of A is? [A]

A) {(a, b) | a >= b and a, b belong to {1, 2, 3}} B) {(a, b) | a > b and a, b belong to {1, 2, 3}} C) {(a, b) | a <= b and a, b belong to {1, 2, 3}} D) {(a, b) | a = b and a, b belong to {1, 2, 3}}

132. Let A and B be two non–empty relations on a set S. Which of the following statements is false? [D]

A) A and B are symmetric ⇒ AB is symmetric B) A and B are symmetric ⇒ AB is symmetric C) A and B are transitive ⇒ AB is transitive D) A and B are transitive ⇒ AB is transitive

133. Suppose a relation R = {(3, 3), (5, 5), (5, 3), (3, 5), (6, 6)} on S = {3, 5, 6}. Here R is known as _____ [A]

A) Equivalence relation B) Partial order relation C) Assymmetric relation D) Irreflexive

134. Determine the partitions of the set {3, 4, 5, 6, 7} from the following subsets. [B]

A) {3,5}, {3,6,7}, {4,5,6} B) {3}, {4,6}, {5}, {7} C) {3,4,6}, {7} D) {5,6}, {5,7}

135. Determine the number of equivalence classes that can be described by the set {2, 4, 5}. [B]

A) 125 B) 5 C) 16 D) 72

136. A function is said to be _____ if and only f(a) = f(b) implies that a = b for all a and b in the domain of f. [B]

A) One–to–many B) One–to–one C) Many–to–many D) Many–to–one

137. Which of the following function f: Z X Z → Z is not onto? [C]

A) f(a, b) = a + b B) f(a, b) = a C) f(a, b) = |b| D) f(a, b) = a – b

138. Let f and g be the function from the set of integers to itself, defined by f(x) = 2x + 1 and g(x) = 3x + 4. Then the composition of f and g is _____ [A]

A) 6x + 9 B) 6x + 7 C) 6x + 6 D) 6x + 8

139. The inverse of f(x) = (x+1)/(x–1) is [A]

A) (x+1)/(x–1) B) (x–1)/(x+1) C) x D) (2x)/(x–1)

140. What is the domain of the function f(x) = √x [C]

A) (2, ∞) B) (– ∞, 1) C) [0, ∞) D) None of the mentioned

141. What is the range of a function? [B]

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

142. What is the range of the function f(x) = 1/x [A]

A) (– ∞, ∞) B) (– ∞, ∞) – {0} C) [0, ∞) D) None of the mentioned

143. What is the range of the function f(x) = 2^x [D]

A) (– ∞, ∞) B) (– ∞, ∞) – {0} C) [0, ∞) D) (0, ∞)

144. The range of f(x) = x^2 + 4 is [A]

A) [4, ∞) B) (– ∞, ∞) – {0} C) [0, ∞) D) None of the mentioned

145. For an inverse to exist it is necessary that a function should be _____ [B]

A) injection B) bijection C) Surjection D) None of the mentioned

146. The inverse of the function f(x) = 3x – 5 is [B]

A) 1/(3x–5) B) (x + 5)/3 C) does not exist since it is not a bijection D) None of the mentioned

147. Let A = {1, 2, 3, 4, 5, 6, 10, 15, 30} and relation "divided by" be partial ordering on A. The all lower bounds of 10 and 15 are [C]

A) 1, 2 B) 1, 3 C) 1, 5 D) 1, 5, 10

148. Which of the following relation is a partial order as well as an equivalence relation? [A]

A) equal to (=) B) less than(<) C) greater than(>) D) not equal to(!=)

149. A Poset in which every pair of elements has both a least upper bound and greatest lower bound is termed as _____ [B]

A) sublattice B) lattice C) trail D) walk

150. Let X = {2, 3, 6, 12, 24}, and ≤ be the partial order defined by X ≤ Y if X divides Y. Number of edges in the Hasse diagram of (X, ≤) is [B]

A) 3 B) 4 C) 5 D) 6

151. The absorption law is defined as [D]

A) a * (a * b) = b B) a * (a ⊕ b) = b C) a * (a * b) = a ⊕ b D) a * (a ⊕ b) = a

152. Which of the following is false? [B]

A) Every totally ordered set is a distributive lattice B) Every distributive lattice is bounded C) Every finite lattice is a complete lattice D) Every finite lattice is bounded

153. The total number of permutations on a set A = {1, 2, 3, 4, 5} is [D]

A) 5 B) 25 C) 32 D) 120

154. Which of the following is an odd permutation? [D]

A) (1, 2, 3) (4, 5, 6) B) (1, 2, 3, 4) (5, 6) C) (1, 2, 3, 4, 5) (6) D) (1, 2, 3, 4, 5, 6)

155. If x < y, then f(x, y) = 0; If y ≤ x, then f(x, y) = f(x-y, y) + 5. The value of f(5, 2) is ____ [C]

A) 0 B) 5 C) 10 D) 15

156. A binary operation defined on a set S is [C]

A) a bijective function from S to S B) a relation from × C) a function from × D) a function from ×

157. if f(x) =x+2 g(x) =x-2 then fog(x)= [B]

A) x square B) x C) x square- 4 D) x+4

158. if f(x)= 2x-3 then f inverse x [C]

A) (x - 3)/2 B) x+3 C) (x + 3)/2 D) (x - 2)/2

159. a cycle of length 2 is called [C]

A) even permutation B) odd permutations C) transposition D) cyclic permutation

160. a set contained 3 elements then the number of permutations ae [D]

A) 1 B) 2 C) 4 D) 6