

ALPHA COLLEGE OF ENGINEERING AND TECHNOLOGY

MCQ TEST PAPER

BE- SEM – 4 – COMPUTER ENGINEERING

3140708 – DISCRETE MATHEMATICS

Answer the following short questions by selecting the correct answer from the given options.

1. 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

2. The truth value of given statement is

‘ $4 + 3 = 7$ or 5 is not prime’.

- a) False
- b) True

3. 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

4. What is the value of x after this statement, assuming 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

5. Let P: I am in Bangalore. , Q: I love cricket. ; Then $q \rightarrow p$ (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

6. 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

7. The truth value of given statement is

‘If 9 is prime then 3 is even’.

- a) False
- b) True

8. Let P: I am in Delhi. , Q: Delhi is clean. ; Then $q \wedge p$ (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

9. 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) $\sim P \vee \sim Q$
- b) $P \wedge \sim Q$
- c) $P \vee Q$
- d) $P \wedge Q$

10. 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) $\sim P \vee \sim Q \vee R$
- b) $P \wedge \sim Q \wedge R$
- c) $P \vee Q \wedge R$
- d) $P \vee Q \wedge \sim R$

11. Let P and Q be statements, then $P \leftrightarrow Q$ is logically equivalent to

- a) $P \leftrightarrow \sim Q$
- b) $\sim P \leftrightarrow Q$
- c) $\sim P \leftrightarrow \sim Q$
- d) None of the mentioned

12. What is the negation of the statement $A \rightarrow (B \vee (or) C)$?

- a) $A \wedge \sim B \wedge \sim C$
- b) $A \rightarrow B \rightarrow C$
- c) $\sim A \wedge B \vee C$
- d) None of the mentioned

13. The compound statement $A \rightarrow (A \rightarrow B)$ is false, then the truth values of A, B are respectively

- a) T, T
- b) F, T
- c) T, F
- d) F, F

14. The statement which is logically equivalent to $A \wedge (and) B$ is

- a) $A \rightarrow B$
- b) $\sim A \wedge \sim B$
- c) $A \wedge \sim B$
- d) $\sim (A \rightarrow \sim B)$

15. Let P: We give a nice overall squad performance, Q: We will win the match.

Then the symbolic form of “We will win the match if and only if we give a nice overall squad performance. “is

- a) $P \vee Q$ b) $Q \wedge P$ c) $Q \leftrightarrow P$ d) $\sim P \vee Q$

16. Let P, Q, R be true, false true , respectively, which of the following is true

- a) $P \wedge Q \wedge R$ b) $P \wedge \sim Q \wedge \sim R$ c) $Q \rightarrow (P \wedge R)$ d) $P \rightarrow (Q \wedge R)$

17. “Match will be played only if it is not a humid day.” The negation of this statement is

- a) Match will be played but it is a humid day b) Match will be played or it is a humid day
c) All of the mentioned statement are correct d) None of the mentioned.

18. Consider the following statements

A: Raju should exercise.

B: Raju is not a decent table tennis player.

C: Raju wants to play good table tennis.

The symbolic form of “Raju is not a decent table tennis player and if he wants to play good table tennis then he should exercise.” is

- a) $A \rightarrow B \rightarrow C$ b) $B \wedge (C \rightarrow A)$ c) $C \rightarrow B \wedge A$ d) $B \leftrightarrow A \wedge C$

19. The statement $(\sim P \leftrightarrow Q) \wedge \sim Q$ is true when

- a) P:True Q: False b) P:True Q:True
c) P:False Q:True d) P :False Q:False

20. Let P, Q, R be true, false, false, respectively, which of the following is true

- a) $P \wedge (Q \wedge \sim R)$ b) $(P \rightarrow Q) \wedge \sim R$ c) $Q \leftrightarrow (P \wedge R)$ d) $P \leftrightarrow (Q \vee R)$

21. Which of the following statements is the negation of the statements “4 is odd or -9 is positive”?

- 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

22. Which of the following represents: $\sim A$ (negation of A) if A stands for “I like badminton but hate maths”?

- 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

23. The compound statement $A \vee \sim (A \wedge B)$ is always

- a) True
- b) False

24. Which of the following are De-Morgan's laws?

- a) $P \wedge (Q \vee R) \equiv (P \wedge Q) \vee (P \wedge R)$
- b) $\sim (P \wedge R) \equiv \sim P \vee \sim R, \sim (P \vee R) \equiv \sim P \wedge \sim R$
- c) $P \vee \sim P \equiv \text{True}, P \wedge \sim P \equiv \text{False}$
- d) none of the mentioned

25. What is the dual of $(A \wedge B) \vee (C \wedge D)$?

- a) $(A \vee B) \vee (C \vee D)$
- b) $(A \vee B) \wedge (C \vee D)$
- c) $(A \vee B) \vee (C \wedge D)$
- d) $(A \wedge B) \vee (C \vee D)$

26. $\sim A \vee \sim B$ is logically equivalent to

- a) $\sim A \rightarrow \sim B$
- b) $\sim A \wedge \sim B$
- c) $A \rightarrow \sim B$
- d) $B \vee A$

27. Negation of statement $(A \wedge B) \rightarrow (B \wedge C)$

- a) $(A \wedge B) \rightarrow (\sim B \wedge \sim C)$
- b) $\sim (A \wedge B) \vee (B \vee C)$
- c) $\sim (A \rightarrow B) \rightarrow (\sim B \wedge C)$
- d) None of the mentioned

28. Which of the following satisfies commutative law?

- a) \wedge
- b) \vee
- c) \leftrightarrow
- d) All of the mentioned

29. If the truth value of $A \vee B$ is true, then truth value of $\sim A \wedge B$ can be

- a) True if A is false
- b) False if A is false
- c) False if B is true and A is false
- d) None of the mentioned

30. If P is always against the testimony of Q ,then the compound statement $P \rightarrow (P \vee \sim Q)$ is
a

- a) Tautology
- b) Contradiction
- c) Contingency
- d) None of the mentioned

31. A compound proposition that is always _____ is called a tautology.

- a) True
- b) False

32. A compound proposition that is always _____ is called a contradiction.

- a) True
- b) False

33. If A is any statement, then which of the following is a tautology?

- a) $A \wedge F$ b) $A \vee F$ c) $A \vee \neg A$ d) $A \wedge T$

34. If A is any statement, then which of the following is not a contradiction?

- a) $A \wedge \neg A$ b) $A \vee F$ c) $A \wedge F$ d) None of mentioned.

35. A compound proposition that is neither a tautology nor a contradiction is called a _____

- a) Contingency b) Equivalence c) Condition d) Inference

36. $\neg (A \vee q) \wedge (A \wedge q)$ is a _____

- a) Tautology b) Contradiction c) Contingency d) None of the mentioned

37. $(A \vee \neg A) \vee (q \vee T)$ is a _____

- a) Tautology b) Contradiction c) Contingency d) None of the mentioned

38. $A \wedge \neg (A \vee (A \wedge T))$ is always _____

- a) True
b) False

39. $(A \vee F) \vee (A \vee T)$ is always _____

- a) True
b) False

40. $A \rightarrow (A \vee q)$ is a _____

- a) Tautology b) Contradiction c) Contingency d) None of the mentioned

41. The contra positive of $p \rightarrow q$ is the proposition:

- a) $\neg p \rightarrow \neg q$ b) $\neg q \rightarrow \neg p$ c) $q \rightarrow p$ d) $\neg q \rightarrow p$

42. The inverse of $p \rightarrow q$ is the proposition:

- a) $\neg p \rightarrow \neg q$ b) $\neg q \rightarrow \neg p$ c) $q \rightarrow p$ d) $\neg q \rightarrow p$

43. The converse of $p \rightarrow q$ is the proposition:

- a) $\neg p \rightarrow \neg q$ b) $\neg q \rightarrow \neg p$ c) $q \rightarrow p$ d) $\neg q \rightarrow p$

44. What is the contrapositive of the conditional statement? "The home team misses whenever it is drizzling?"

- a) If it is drizzling, then home team misses
b) If the home team misses, then it is drizzling
c) If it is not drizzling, then the home team does not misses
d) If the home team wins, then it is not drizzling

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

- 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.”

46. What are 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.”

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

- 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

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

- 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.”

49. What are the contrapositive of the conditional statement “Medha will find a decent job when she labour hard.”?

- a) “If Medhalabour hard, then she will find a decent job.”
- b) “If Medha will not find a decent job, then she not labour hard.”
- c) “If Medha will find a decent job, then she labour hard.”
- d) “If Medha not labour hard, then she will not find a decent job.”

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

- 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

51. A non empty set A is termed as an algebraic structure _____

- a) With respect to binary operation *
- b) With respect to ternary operation?
- c) With respect to binary operation +
- d) With respect to unary operation –

52. An algebraic structure ____ is called a semigroup.

- a) $(P, *)$
- b) $(Q, +, *)$
- c) $(P, +)$
- d) $(+, *)$

53. Condition for monoid is _____

- a) $(a + e) = a$
- b) $(a * e) = (a + e)$
- c) $a = (a * (a + e))$
- d) $(a * e) = (e * a) = a$

54. A monoid is called a group if _____

- a) $(a * a) = a = (a + c)$
- b) $(a * c) = (a + c)$
- c) $(a + c) = a$
- d) $(a * c) = (c * a) = e$

55. A group $(M, *)$ is said to be abelian if _____

- a) $(x + y) = (y + x)$
- b) $(x * y) = (y * x)$
- c) $(x + y) = x$
- d) $(y * x) = (x + y)$

56. Matrix multiplication is a/an _____ property.

- a) Commutative
- b) Associative
- c) Additive
- d) Disjunctive

57. A cyclic group can be generated by a/an _____ element.

- a) Singular
- b) Non-singular
- c) Inverse
- d) Multiplicative

58. How many properties can be held by a group?

- a) 2
- b) 3
- c) 5
- d) 4

59. A cyclic group is always _____

- a) Abelian group
- b) Monoid
- c) Semigroup
- d) Subgroup

60. $\{1, i, -i, -1\}$ is _____

- a) Semi group
- b) Subgroup
- c) Cyclic group
- d) Abelian group

61. _____ are called group postulates.

- a) Group lemmas
- b) Group theories
- c) Group axioms
- d) Group

62. A subgroup has the properties of _____

- a) Closure, associative
- b) Commutative, associative, closure
- c) Inverse, identity, associative
- d) Closure, associative, Identity, Inverse

63. If $a * b = a$ such that $a * (b * c) = a * b = a$ and $(a * b) * c = a * b = a$ then _____

- a) $*$ is associative
- b) $*$ is commutative
- c) $*$ is closure
- d) $*$ is abelian

64. The set of odd and even positive integers closed under multiplication is _____

- a) a free semi group of (M, \times)
- b) a sub semi group of (M, \times)
- c) a semi group of (M, \times)
- d) a subgroup of (M, \times)

65. If F is a free semigroup on a set S , then concatenation of two even words is _____

- a) a semi group of F
- b) a subgroup of F
- c) Monoid of F
- d) Cyclic group of F

66. The set of rational numbers form an abelian group under _____

- a) Association
- b) Closure
- c) Multiplication
- d) Addition

67. Condition of semigroup homomorphism should be _____

- a) $f(x * x) = f(x * y)$
- b) $f(x) = f(y)$
- c) $f(x) * f(y) = f(y)$
- d) $f(x * y) = f(x) * f(y)$

68. A function $f:(M,*) \rightarrow (N,\times)$ is a homomorphism if _____

- a) $f(a, b) = a * b$
- b) $f(a, b) = a/b$
- c) $f(a, b) = f(a) + f(b)$
- d) $f(a, b) = f(a) * f(a)$

69. A function defined by $f(x) = 2 * x$ such that $f(x + y) = 2x + y$ under the group of real numbers, then _____

- a) Isomorphism exists
- b) Homomorphism exists
- c) Heteromorphic exists
- d) Association exists

70. If $x * y = x + y + x y$ then $(G, *)$ is _____

- a) Monoid
- b) Abelian group
- c) Commutative semi group
- d) Cyclic group

71. Let $(A_7, \otimes_7) = (\{1, 2, 3, 4, 5, 6\}, \otimes_7)$ is a group. It has two sub groups X and Y . $X = \{1, 3, 6\}$, $Y = \{2, 3, 5\}$. What is the order of union of subgroups?

- a) 65
- b) 5
- c) 32
- d) 18

72. A relation $(34 \times 78) \times 57 = 57 \times (78 \times 34)$ can have _____ property.

- a) Distributive
- b) Associative
- c) Commutative
- d) Closure

73. $B_1: (\{0, 1, 2, \dots, (n-1)\}, x_n)$ where x_n stands for “multiplication-modulo- n ” and $B_2: (\{0, 1, 2, \dots, n\}, x_n)$ where x_n stands for “multiplication-modulo- m ” are the two statements. Both B_1 and B_2 are considered to be _____

- a) Groups b) Semi groups c) Subgroups d) Associative subgroup

74. If the group G has 65 elements and it has two subgroups namely K and L with order 14 and 30. What can be order of K intersection L ?

- a) 10 b) 42 c) 5 d) 35

75. Consider the binary operations on X , $a * b = a + b + 4$, for $a, b \in X$. It satisfies the properties of _____

- a) Abelian group b) Semi group
c) Multiplicative group d) Isomorphic group

76. Let $*$ be the binary operation on the rational number given by $a * b = a + b + ab$. Which of the following property does not exist for the group?

- a) Closure property b) Identity property
c) Symmetric property d) Associative property

77. Let G be a finite group with two sub groups M & N such that $|M|=56$ and $|N|=123$. Determine the value of $|M \cap N|$.

- a) 1 b) 56 c) 14 d) 78

78. A group G , $(\{0\}, +)$ under addition operation satisfies which of the following properties?

- a) Identity, multiplicity and inverse
b) Closure, associativity, inverse and identity
c) Multiplicity, associativity and closure
d) Inverse and closure

79. If $(M, *)$ is a cyclic group of order 73, then number of generator of G is equal to _____

- a) 89 b) 23 c) 72 d) 17

80. The set of even natural numbers, $\{6, 8, 10, 12, \dots\}$ is closed under addition operation. Which of the following properties will it satisfy?

- a) Closure property b) Associative property
c) Symmetric property d) Identity property

81. In a group there must be only _____ element.

- a) 1 b) 2 c) 3 d) 5

82. _____ is the multiplicative identity of natural numbers.

- a) 0 b) -1 c) 1 d) 2

83. An identity element of a group has _____ element.

- a) Associative b) Commutative c) Inverse d) Homomorphic

84. _____ matrices do not have multiplicative inverses.

- a) Non-singular b) Singular c) Triangular d) Inverse

85. If X is an idempotent nonsingular matrix, then X must be _____

- a) Singular matrix b) Identity matrix
c) Idempotent matrix d) Nonsingular matrix

86. If A, B, and C are invertible matrices, the expression $(AB^{-1})^{-1} (CA^{-1})^{-1} C^2$ evaluates to

- a) BC b) $C^{-1} BC$ c) AB^{-1} d) $C^{-1} B$

87. If the sum of elements in each row of an $n \times n$ matrix Z is zero, then the matrix is

- a) Inverse b) Non-singular c) Additive inverse d) Singular

88. _____ are the symmetry groups used in the Standard model.

- a) Lie groups b) Subgroups c) Cyclic groups d) Poincare groups

89. A semigroup S under binary operation * that has an identity is called _____

- a) Multiplicative identity b) Monoid c) Subgroup d) Homomorphism

90. An element a in a monoid is called an idempotent if _____

- a) $a^{-1} = a * a^{-1}$ b) $a * a^2 = a$ c) $a^2 = a * a = a$ d) $a^3 = a * a$

91. A trivial subgroup consists of _____

- a) Identity element b) Coset c) Inverse element d) Ring

92. Minimum subgroup of a group is called _____

- a) A commutative subgroup b) A lattice
c) A trivial group d) A monoid

93. Let K be a group with 8 elements. Let H be a subgroup of K and $H < K$. It is known that the size of H is at least 3. The size of H is _____

- a) 8 b) 2 c) 3 d) 4

94. _____ is not necessarily a property of a Group.

- a) Commutativity
- b) Existence of inverse for every element
- c) Existence of Identity
- d) Associativity

95. A group of rational numbers is an example of _____

- a) A subgroup of a group of integers
- b) A subgroup of a group of real numbers
- c) A subgroup of a group of irrational numbers
- d) A subgroup of a group of complex numbers

96. Intersection of subgroups is a _____

- a) Group
- b) Subgroup
- c) Semigroup
- d) Cyclic group

97. The group of matrices with determinant _____ is a subgroup of the group of invertible matrices under multiplication.

- a) 2
- b) 3
- c) 1
- d) 4

98. What is a circle group?

- a) A subgroup complex numbers having magnitude 1 of the group of nonzero complex elements
- b) A subgroup rational numbers having magnitude 2 of the group of real elements
- c) A subgroup irrational numbers having magnitude 2 of the group of nonzero complex elements
- d) A subgroup complex numbers having magnitude 1 of the group of whole numbers

99. A normal subgroup is _____

- a) A subgroup under multiplication by the elements of the group
- b) An invariant under closure by the elements of that group
- c) A monoid with same number of elements of the original group
- d) An invariant equipped with conjugation by the elements of original group

100. Two groups are isomorphic if and only if _____ is existed between them.

- a) Homomorphism
- b) Endomorphism
- c) Isomorphism
- d) Association

101. $a * H$ is a set of _____ coset.

- a) Right
- b) Left
- c) Sub
- d) Semi

102. $a * H = H * a$ relation holds if _____

- a) H is semi group of an abelian group
- b) H is monoid of a group
- c) H is a cyclic group
- d) H is subgroup of an abelian group

103. Lagrange's theorem specifies _____

- a) The order of semigroup is finite
- b) The order of the subgroup divides the order of the finite group
- c) The order of an abelian group is infinite
- d) The order of the semigroup is added to the order of the group

104. A function is defined by $f(x)=2x$ and $f(x + y) = f(x) + f(y)$ is called _____

- a) Isomorphic
- b) Homomorphic
- c) Cyclic group
- d) Heteromorphic

105. An isomorphism of a group onto itself is called _____

- a) Homomorphism
- b) Heteromorphism
- c) Epimorphism
- d) Automorphism

106. The elements of a vector space form a/an _____ under vector addition.

- a) Abelian group
- b) Commutative group
- c) Associative group
- d) Semi group

107. A set of representatives of all the cosets is called _____

- a) Transitive
- b) Reversal
- c) Equivalent
- d) Transversal

108. Which of the following statement is true?

- a) The set of all rational negative numbers forms a group under multiplication
- b) The set of all matrices forms a group under multiplication
- c) The set of all non-singular matrices forms a group under multiplication
- d) The set of matrices forms a subgroup under multiplication

109. How many different non-isomorphic Abelian groups of order 8 are there?

- a) 5
- b) 4
- c) 2
- d) 3

110. Consider the set B^* of all strings over the alphabet set $B = \{0, 1\}$ with the concatenation operator for strings _____

- a) Does not form a group
- b) Does not have the right identity element
- c) Forms a non-commutative group
- d) Forms a group if the empty string is removed from

111. An infinite cyclic group does not have a _____ series.

- a) AP
- b) GP
- c) Composite
- d) Finite

112. Every cyclic group is a/an _____

- a) Infinite subgroup
- b) Abelian group
- c) Monoid
- d) Commutative semi group

113. What is an irreducible module?

- a) A cyclic module in a ring with any non-zero element as its generator
- b) A cyclic module in a ring with any positive integer as its generator
- c) An acyclic module in a ring with rational elements as its generator
- d) A linearly independent module in a semigroup with a set of real numbers

114. A finite group G of order 219 is _____

- a) A semi group
- b) A subgroup
- c) A commutative inverse
- d) A cyclic group

115. The number of generators of cyclic group of order 219 is _____

- a) 144
- b) 124
- c) 56
- d) 218

116. The order of a simple abelian group is _____

- a) Infinite
- b) Real number
- c) Finite
- d) Prime

117. The Number of Elements Satisfying $g^7=e$ in a finite Group F is _____

- a) Even
- b) Not a number
- c) Odd
- d) Rational

118. All the rings of order p^2 is _____

- a) Associative
- b) Cyclic
- c) Inverse
- d) Commutative

119. An element of a commutative ring $R(1 \neq 0)$ is nilpotent if _____

- a) $a+1=0$
- b) $a^n = 0$, for some positive integer n
- c) $a^n = 1$, for some integer n
- d) $a^2 = 0$

120. A group G of order 20 is _____

- a) Solvable
- b) Unsolvable
- c) 1
- d) Not determined

121. Consider an integer 23 such that $23 \geq 3p$ for a $2p$ -cycle in a permutation group, then p is _____

- a) Odd prime
- b) Even prime
- c) Rational number
- d) Negative prime

122. Suppose $K_m = \{P \in S_m, |P| \text{ is odd prime}\}$. Determine the set for which $m \geq 3$ K_m a subgroup of S_m .

- a) $\{3, 5, 7, 11, 13, \dots\}$
- b) $\{-14, -8, -3, 0, 3, 8, 14\}$
- c) $\{2, 4, 6, 8, 10, 12\}$
- d) $\{12, 25, 56, 78, 134, \dots\}$

123. The dihedral group having order 6 can have degree _____

- a) 3 b) 26 c) 326 d) 208

124. Let $(z, *)$ is a group with $x * y = x + y - 2$ then inverse of x is _____

- a) $-(x + 4)$ b) $(x^2 + 6)$ c) $(x + y) / 5$ d) $(3y + 4x^2)$

125. Let X be a n -square matrix such that $Y = X + 8I$. Which of the following property will exist?

- a) Idempotent b) Y transpose is nilpotent c) X nilpotent d) Y inverse

126. Suppose, M is a lower triangular matrix with all diagonal entries zero. The resultant matrix of $M+I$ will be _____

- a) Idempotent b) Singular c) Nilpotent d) Inverse

127. If Y^{98} (a raised to the power of 5) = 0 and Y is a 97-square matrix. Determine the value of Y^{97} .

- a) $I+Y$ b) $-Y+3$ c) 0 d) Y^2

128. If 54th row of a 67th row matrix is linearly independent with each other then find the rank of the matrix.

- a) 61 b) 54 c) 187 d) 32

129. Let M be an 4×4 matrix with real entries such that $M^k = 0$, for some $k \geq 1$. Find the determinant value of $(I + M)$, where, I be the 4×4 identity matrix.

- a) 72 b) 1 c) 4 d) 36

130. Suppose $(2, 5, 8, 4)$ and $(3, 6)$ are the two permutation groups that form cycles. What type of permutation is this?

- a) odd b) Even c) Acyclic d) Prime

(131) A graph G is called a _____, if it is a connected acyclic graph

- a) Cyclic graph b) Regular graph c) Tree d) Not a graph

(132) What is the probability of choosing correctly an unknown integer between 0 and 9 with 3 chances?

- a) 963/1000 b) 966/1000 c) 968/1000 d) 969/1000

(133) In an undirected graph the number of nodes with odd degree must be

- a) Zero b) Odd c) Prime d) Even

(134) A graph is a collection of

- a) Row and columns b) Vertices and edges
c) Equations d) None of these

(135) The relation $\{ (1,2), (1,3), (3,1), (1,1), (3,3), (3,2), (1,4), (4,2), (3,4) \}$ is

- a) Reflexive b) Transitive c) Symmetric d) Asymmetric

(136) An undirected graph possesses a eulerian circuit if and only if it is connected and its vertices are

- a) All of even degree b) All of odd degree
c) Of any degree d) Even in number

(137) How many relations are there on a set with n elements that are symmetric and a set with n elements that are reflexive and symmetric?

- a) $2n(n+1)/2$ and $2n \cdot 3n(n-1)/2$ b) $3n(n-1)/2$ and $2n(n-1)$
c) $2n(n+1)/2$ and $3n(n-1)/2$ d) $2n(n+1)/2$ and $2n(n-1)/2$

(138) The number of colors required to properly color the vertices of every planer graph is

- a) 2 b) 3 c) 4 d) 5

(139) In how many ways can a president and vice president be chosen from a set of 30 candidates?

- a) 820 b) 850 c) 880 d) 870

(140) Consider an undirected random graph of eight vertices. The probability that there is an edge between a pair of vertices is $1/2$. What is the expected number of unordered cycles of length three?

- a) $1/8$ b) 1 c) 7 d) 8

(141) In a graph if $e = (u, v)$ means

- a) u is adjacent to v but v is not adjacent to u
b) e begins at u and ends at v
c) u is processor and v is successor
d) Both b and c

(142) A minimal spanning tree of a graph G is

- a) A spanning sub graph b) A tree
c) Minimum weights d) All of above

(143) The number of leaf nodes in a complete binary tree of depth d is

- a) $2d$ b) $2d-1+1$ c) $2d+1+1$ d) $2d+1$

(144) A partial ordered relation is transitive, reflexive and

- a) Antisymmetric b) Bisymmetric c) Anti reflexive. d) Asymmetric

(145) In a graph if $e = [u, v]$, Then u and v are called

- a) Endpoints of e b) Adjacent nodes c) Neighbors d) All of above

(146) In how many ways can a hungry student choose 3 toppings for his prize from a list of 10 delicious possibilities?

- a) 100 b) 120 c) 110 d) 150

(147) A graph with n vertices will definitely have a parallel edge or self loop if the total numbers of edges are

- a) Greater than $n - 1$ b) less than $n(n - 1)$
c) Greater than $n(n - 1) / 2$ d) less than $n^2 / 2$

(148) A vertex of a graph is called even or odd depending upon

- a) Total number of edges in a graph is even or odd
b) Total number of vertices in a graph is even or odd
c) Its degree is even or odd
d) None of these

(149) In any undirected graph the sum of degrees of all the nodes

- a) Must be even
b) Are twice the number of edges
c) Must be odd
d) Need not be even

(150) The expression $a + a \cdot c$ is equivalent to

- a) a b) $a + c$ c) c d) 1

(151) A graph with one vertex and no edges is

- a) Multigraph b) Digraph c) Isolated graph d) Trivial graph

(152) Length of the walk of a graph is

- a) The number of vertices in walk W b) The number of edges in walk W
c) Total number of edges in a graph d) Total number of vertices in a graph

(153) The number of colors required to properly color vertices of every planar graph is

- a) 2 b) 3 c) 4 d) 5

(154) A graph with no edges is known as empty graph. Empty graph is also known as

- a) Trivial graph b) Regular graph
c) Bipartite graph d) None of these

(155) Which two of the following are equivalent for an undirected graph G?

- (i) G is a tree
- (ii) There is at least one path between any two distinct vertices of G
- (iii) G contains no cycles and has $(n-1)$ edges
- (iv) G has n edges

- a) (i) and (ii) b) (i) and (iii) c) (i) and (iv) d) (ii) and (iii)

(156) Choose the most appropriate definition of plane graph

- a) A graph drawn in a plane in such a way that any pair of edges meet only at their end vertices.
- b) A graph drawn in a plane in such a way that if the vertex set of graph can be partitioned into two non - empty disjoint subset X and Y in such a way that each edge of G has one end in X and one end in Y.
- c) A simple graph which is Isomorphic to Hamiltonian graph
- d) None of these

(157) A continuous non intersecting curve in the plane whose origin and terminus coincide

- a) Planer b) Jordan c) Hamiltonian d) All of these

(158) A graph with n vertices will definitely have a parallel edge or self loop of the total number of edges are

- a) more than n b) more than $n + 1$ c) more than $(n + 1) / 2$ d) more than $n(n - 1) / 2$

(159) A debating team consists of 3 boys and 2 girls. Find the number of ways they can sit in a row?

- a) 120 b) 24 c) 720 d) 12

(160) Which one of the following statements is incorrect?

- a) The number of regions corresponds to the cyclomatic complexity.
- b) Cyclometric complexity for a flow graph G is $V(G) = N - E + 2$, where E is the number of edges and N is the number of nodes in the flow graph.
- c) Cyclometric complexity for a flow graph G is $V(G) = E - N + 2$, where E is the number of edges & N is the number of nodes in the flow graph.
- d) Cyclometric complexity for a flow graph G is $V(G) = P + 1$, where P is the number of predicate nodes contained in the flow graph G.

(161) Which of the following pair is not congruent modulo 7?

- a) 10, 24 b) 25, 56 c) -31, 11 d) -64, -15

(162) The maximum degree of any vertex in a simple graph with n vertices is

- a) $n - 1$ b) $n + 1$ c) $2n - 1$ d) n

(163) The complete graph with four vertices has k edges where k is

- a) 3 b) 4 c) 5 d) 6

(164) Consider a weighted undirected graph with positive edge weights and let (u, v) be an edge in the graph. It is known that the shortest path from source vertex s to u has weight 53 and shortest path from s to v has weight 65. Which statement is always true?

- a) Weight $(u, v) \leq 12$ b) Weight $(u, v) = 12$
c) Weight $(u, v) \geq 12$ d) Weight $(u, v) > 12$

(165) How many onto (or surjective) functions are there from an n-element ($n \geq 2$) set to a 2-element set?

- a) 2^n b) $2^n - 1$ c) $2^n - 2$ d) $2(2^n - 2)$

(166) Suppose v is an isolated vertex in a graph, then the degree of v is

- a) 0 b) 1 c) 2 d) 3

(167) The number of nodes in a complete binary tree of height h (with roots at level 0) is equal to

- a) $2^0 + 2^1 + \dots + 2^h$ b) $2^0 + 2^1 + \dots + 2^{h-1}$
c) $2^0 + 2^1 + \dots + 2^{h+1}$ d) $2^1 + \dots + 2^{h+1}$

(168) Hasse diagram are drawn from

- a) Partially ordered sets b) Lattices c) Boolean algebra d) none of these

(169) In how many ways can 5 balls be chosen so that 2 are red and 3 are black?

- a) 910 b) 990 c) 970 d) 960

(170) Circle has _____

- a) No vertices b) Only 1 vertex c) 8 vertices d) None of these

(171) How many different words can be formed out of the letters of the word VARANASI?

- a) 64 b) 120 c) 40320 d) 720

(172) A graph is tree if and only if

- a) Is planar b) Contains a circuit
c) Is minimally d) Is completely connected

(173) If B is a Boolean algebra, then which of the following is true

- a) B is a finite but not complemented lattice
- b) B is a finite, complemented and distributive lattice
- c) B is a finite, distributive but not complemented lattice
- d) B is not distributive lattice

(174) Let G be a simple undirected planar graph on 10 vertices with 15 edges. If G is a connected graph, then the number of bounded faces in any embedding of G on the plane is equal to

- a) 3
- b) 4
- c) 5
- d) 6

(175) The number of distinguishable permutations of the letters in the word BANANA are,

- a) 60
- b) 36
- c) 20
- d) 10

(176) If R is a relation "Less Than" from $A = \{1, 2, 3, 4\}$ to $B = \{1, 3, 5\}$ then $R \circ R^{-1}$ is

- a) $\{(3,3), (3,4), (3,5)\}$
- b) $\{(3,1), (5,1), (3,2), (5,2), (5,3), (5,4)\}$
- c) $\{(3,3), (3,5), (5,3), (5,5)\}$
- d) $\{(1,3), (1,5), (2,3), (2,5), (3,5), (4,5)\}$

(177) Two sets are called disjoint if there _____ is the empty set.

- a) Union
- b) Difference
- c) Intersection
- d) Complement

(178) The complement of the set A is _____

- a) $A - B$
- b) $U - A$
- c) $A - U$
- d) $B - A$

(179) The set difference of the set A with null set is

- a) A
- b) null
- c) U
- d) B

(180) How many even 4-digit whole numbers are there?

- a) 1358
- b) 7250
- c) 4500
- d) 3600

(181) How many five-digit numbers can be made from the digits 1 to 7 if repetition is allowed?

- a) 16807
- b) 54629
- c) 23467
- d) 32354

(182) Which sets are not empty?

- a) $\{x: x \text{ is an even prime greater than } 3\}$
- b) $\{x: x \text{ is a multiple of } 2 \text{ and is odd}\}$
- c) $\{x: x \text{ is an even number and } x+3 \text{ is even}\}$
- d) $\{x: x \text{ is a prime number less than } 5 \text{ and is odd}\}$

(183) In which of the following sets $A - B$ is equal to $B - A$

- a) $A = \{1, 2, 3\}$, $B = \{2, 3, 4\}$
- b) $A = \{1, 2, 3\}$, $B = \{1, 2, 3, 4\}$
- c) $A = \{1, 2, 3\}$, $B = \{2, 3, 1\}$
- d) $A = \{1, 2, 3, 4, 5, 6\}$, $B = \{2, 3, 4, 5, 1\}$

(184) If in sets A, B, C , the set $B \cap C$ consists of 8 elements, set $A \cap B$ consists of 7 elements and set $C \cap A$ consists of 7 elements then the minimum element in set $A \cup B \cup C$ will be

- a) 8
- b) 14
- c) 22
- d) 15

(185) A function is said to be _____ if and only if $f(a) = f(b)$ implies that $a = b$ for all a and b in the domain of f

- a) One-to-many
- b) One-to-one
- c) Many-to-many
- d) Many-to-one

(186) Which of the following function $f: \mathbb{Z} \times \mathbb{Z} \rightarrow \mathbb{Z}$ is not onto?

- a) $f(a, b) = a + b$
- b) $f(a, b) = a$
- c) $f(a, b) = |b|$
- d) $f(a, b) = a - b$

(187) 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) $6x + 9$
- b) $6x + 7$
- c) $6x + 6$
- d) $6x + 8$

(188) The inverse of function $f(x) = x^3 + 2$ is _____

- a) $f^{-1}(y) = (y - 2)^{1/2}$
- b) $f^{-1}(y) = (y - 2)^{1/3}$
- c) $f^{-1}(y) = (y)^{1/3}$
- d) $f^{-1}(y) = (y - 2)$

(189) How many binary relations are there on a set S with 9 distinct elements?

- a) 2^{90}
- b) 2^{100}
- c) 2^{81}
- d) 2^{60}

(190) R is a binary relation on a set S and R is reflexive if and only if

- a) $r(R) = R$
- b) $s(R) = R$
- c) $t(R) = R$
- d) $f(R) = R$

(191) The transitive closure of the relation $\{(0,1), (1,2), (2,2), (3,4), (5,3), (5,4)\}$ on the set $\{1, 2, 3, 4, 5\}$ is _____

- a) $\{(0,1), (1,2), (2,2), (3,4)\}$
- b) $\{(0,0), (1,1), (2,2), (3,3), (4,4), (5,5)\}$
- c) $\{(0,1), (1,1), (2,2), (5,3), (5,4)\}$
- d) $\{(0,1), (0,2), (1,2), (2,2), (3,4), (5,3), (5,4)\}$

(192) The less-than relation, $<$, on a set of real numbers is _____

- a) Not a partial ordering because it is not asymmetric and irreflexive equals antisymmetric
- b) a partial ordering since it is asymmetric and reflexive
- c) a partial ordering since it is antisymmetric and reflexive
- d) not a partial ordering because it is not antisymmetric and reflexive

(193) Suppose a relation $R = \{(3, 3), (5, 5), (5, 3), (5, 5), (6, 6)\}$ on $S = \{3, 5, 6\}$. Here R is known as _____

- | | |
|-------------------------|------------------------|
| a) Equivalence relation | b) Reflexive relation |
| c) Symmetric relation | d) Transitive relation |

(194) Consider the congruence $45 \equiv 3 \pmod{7}$. Find the set of equivalence class representatives

- | | |
|-------------------------------------|-------------------------------------|
| a) $\{\dots, 0, 7, 14, 28, \dots\}$ | b) $\{\dots, -3, 0, 6, 21, \dots\}$ |
| c) $\{\dots, 0, 4, 8, 16, \dots\}$ | d) $\{\dots, 3, 8, 15, 21, \dots\}$ |

(195) Which of the following relations is the reflexive relation over the set $\{1, 2, 3, 4\}$?

- | | |
|--------------------------------------------|---------------------------------------------------|
| a) $\{(0,0), (1,1), (2,2), (2,3)\}$ | b) $\{(1,1), (1,2), (2,2), (3,3), (4,3), (4,4)\}$ |
| c) $\{(1,1), (1,2), (2,1), (2,3), (3,4)\}$ | d) $\{(0,1), (1,1), (2,3), (2,2), (3,4), (3,1)\}$ |

(196) For $a, b \in \mathbb{R}$ define $a = b$ to mean that $|x| = |y|$. If $[x]$ is an equivalence relation in \mathbb{R} . Find the equivalence relation for $[17]$

- | | |
|------------------------------------------|---------------------------------|
| a) $\{\dots, -11, -7, 0, 7, 11, \dots\}$ | b) $\{2, 4, 9, 11, 15, \dots\}$ |
| c) $\{-17, 17\}$ | d) $\{5, 25, 125, \dots\}$ |