

**Department Computer science**  
**Class: F. Y. B. Sc. (CS)**  
**Semester-1**  
**Subject-Discrete Mathematics**  
**Sample Questions**

**Multiple choice questions**

1. A language is regular if and only if

- a. accepted by DFA
- b. accepted by PDA
- c. accepted by LBA
- d. accepted by Turing machine

2.. If  $R = ((1, 1), (3, 1), (2, 3), (4, 2))$ , then which of the following represents  $R^2$ , where  $R^2$  is  $R$  composite  $R$ ?

- a.  $((1, 1), (2, 1), (4, 3), (3, 1))$
- b.  $((1, 1), (3, 1), (2, 3), (4, 2))$
- C.  $((1, 3), (3, 3), (3, 4), (3, 2))$
- d.  $((1, 1), (9, 1), (4, 9), (16, 4))$

3. The number of edges in a complete graph with 'n' vertices is equal to:

- a.  $2n-1$
- b.  $n(n-1)$
- C.  $n^2$
- d.  $n(n-1)/2$

4. Regular grammar is

- a. context free grammar
- b. non context free grammar
- c. english grammar
- d. non English grammar

5. A function is a Domain of:

- a. it is set of natural numbers for which a function is defined
- b. the maximal set of numbers for which a function is defined
- C. the maximal set of numbers which a function can take values
- d. it is set of real numbers.

6. What is the number of edges of the greatest planar subgraph of  $K_{3,2}$  where  $m, n \leq 3$ ?

- a. 18
- b. 6
- c. 128
- d. 702

7. A non-planar graph can have \_\_\_\_\_

- a. complete graph
- b. subgraph
- c. line graph
- d. bar graph

8. For a connected planar simple graph  $G=(V, E)$  with  $e=|E|=16$  and  $v=|V|=9$ , then find the number of regions that are created when drawing a planar representation of the graph?

- a. 321
- b. 9
- c. 1024
- d. 596

9. A relation  $R$  in a set  $X$  is symmetric if \_\_\_\_\_

- a.  $xRy, yRz \Rightarrow xRz$ .
- b.  $xRy$
- c.  $xRy \Rightarrow yRx$
- d.  $xRx$

10. If  $R$  is reflexive, symmetric and transitive then the relation is said to be \_\_\_\_\_.

- a. Binary relation
- b. Compatibility relation
- c. Equivalence relation
- d. Partial order relation

11. A graph in which every vertex has same degree is called \_\_\_\_\_ graph.

- a. regular
- b. simple
- c. complete
- d. null

12. The number of vertices of odd degree in a graph is always \_\_\_\_\_.

- a. odd
- b. even
- c. zero
- d. one

13. Which of the following is union of  $\{1, 2, 5\}$  and  $\{1, 2, 6\}$ ?

- a.  $\{1, 2, 5, 6\}$
- b.  $\{1, 2, 6, 1\}$
- c.  $\{1, 2, 1, 2\}$
- d.  $\{1, 5, 6, 3\}$

14. Which of the following is complement of the set  $A$ ?

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

15. Which of the following statement is false?

a.  $A \cap A = A$

b.  $(A \cup B)' = A' \cup B'$

c.  $A \cup A = A$

d.  $A - (B \cap C) = (A - B) \cup (A - C)$

16. Which of the following statements for a simple graph is correct?

a. Every path is a trail

b. Every trail is a path

c. Every trail is a path as well as every path is a trail

d. Path and trail have no relation

17. A connected planar graph having 6 vertices, 7 edges contains \_\_\_\_\_ regions.

a. 15

b. 3

c. 1

d. 11

18. Which of the following properties does a simple graph not hold?

a. Must be connected

b. Must be unweighted

c. Must have no loops or multiple edges

d. Must have no multiple edges

19. How many even 4 digit whole numbers are there?

a. 1358

b. 7250

c. 4500

d. 3600

20. 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

21. Amit must choose a seven-digit PIN number and each digit can be chosen from 0 to 9. How many different possible PIN numbers can Amit choose?

a. 10000000

b. 9900000

c. 67285000

d. 39654900

22. How many different choices can be made from 5 roses, 4 marigold and 8 sunflowers if at least one flower is to be chosen for making of garland?

a. 269

b. 270

c. 281

d. 320

23. In how many ways 6 pens can be selected from 15 identical black pens?

a.  $9 \cdot 3!$

b. 21

c. 14!

d. 1

24. Determine the number of ways of selecting one or more letters from the letters BBBB?

a. 6

b. 73

c. 23

d. 56

25. Find the number of ways in which 4 people E, F, G, H, A, C can be seated at a round table, such that E and F must always sit together.

a. 32

b. 290

c. 124

d. 45

26. 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.  $A \wedge T$

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

\_\_\_\_\_

a. Contingency

b. Equivalence

c. Condition

d. Inference

28.  $\neg (A \vee q) \wedge (A \wedge q)$  is a \_\_\_\_\_

a. Tautology

b. Contradiction

c. Contingency

d. Equivalence

29.  $(A \vee \neg A) \vee (q \vee T)$  is a \_\_\_\_\_

a. Tautology

b. Contradiction

c. Contingency

d. Equivalence

30. 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.  $P \rightarrow (Q \wedge R)$

31. For a given graph G having v vertices and e edges which is connected and has no cycles, which of the following statements is true?

a.  $v = e$

b.  $v = e + 1$

c.  $v + 1 = e$

d.  $v = e - 1$

32. A graph with all vertices having equal degree is known as a \_\_\_\_\_

a. Multi Graph

b. Regular Graph

c. Simple Graph

d. Complete Graph

33. Which of the following ways can be used to represent a graph?

a. Adjacency List and Adjacency Matrix

b. Incidence Matrix

c. Adjacency List, Adjacency Matrix as well as Incidence Matrix

d. No way to represent

34. "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. Match will be played and it is humid day

35. 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

36. A path of length  $n$  is a sequence of  $n+1$  vertices & .....consecutive edges.

a.  $2n$ .

b.  $n$

c.  $n-1$

d.  $3n$

37. A graph  $G$  is called tree if it is a connected .....

a. Acyclic graph.

b. Cyclic graph

c. Simple graph.

d. Trivial graph

38. An edge that starts & ends at the same .....

a. Edge.

b. Vertex

c. loop.

d. cyclic

39.  $G$  is..... graph if each edge has been associated with an ordered pair of vertices.

a. Directed

b. Planar

c. Simple

d. Complete

40. A graph without loops or parallel edges is called.....

a. Planar.

b. Simple

c. Trivial

d. Bipartite

41. Which of the following is contained in a recursive grammar?

a. semantic rules

b. production rules

c. recursive language

d. recursive function

42. If origin & terminal of a walk are same the walk is known as.....

a. Open.

b. Closed

c. Path.

d. Walk

43. An undirected graph has even number of vertices with .....degree.

a. Odd

b. Even

c. Positive.

d. Negative

44. 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

45. A graph with one vertex and no edges is.....

a. multigraph

b. digraph

C. isolated graph

d. trivial graph

46. 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

47. A graph with all vertices having equal degree is known as a \_\_\_\_\_

a. Multi Graph

b. Regular Graph

c. Simple Graph

d. Complete Graph

48. An edge that starts and ends vertex are same is called.....

a. loop.

b. Tree

C. Parallel.

d. Digraph

49. An ..... cycle in a graph G is a simple cycle that passes through every edge of G only once.

- a.simple
- b.Regular
- c.Euler.
- d.Path

50.A graph is.....if every pair of vertices can be connected by a path.

- a. Connected.
- b.Regular
- c.Complete.
- d.Bipartite

51.Each connected subgraph of a non Connected graph G is called

- a.....of G.
- a.Subgraph.
- b. Component
- c. Parallel.
- d. loop

52.If T is a tree of order n, then T has .....edges.

- a.n.
- b.n-1
- c.2n.
- d.n-2

53. If F is a cut set of the connected graph G,then G-F has ..... components.

- a.one.
- b.Two
- c.Three.
- d.Four

54. The binary relation  $\{(1,1), (2,1), (2,2), (2,3), (2,4), (3,1), (3,2)\}$  on the set  $\{1, 2, 3\}$  is \_\_\_\_\_

- a. reflexive, symmetric and transitive
- b. irreflexive, symmetric and transitive
- c. neither reflexive, nor irreflexive but transitive
- d. irreflexive and antisymmetric

55. The chromatic number of a graph is the property of \_\_\_\_\_

- a. graph coloring
- b. graph ordering
- c. group ordering
- d. group coloring

56. If a graph  $G$  is  $k$ -colorable and  $k < n$ , for any integer  $n$  then it is \_\_\_\_\_

- a.  $n$ -colorable
- b.  $n^2$  nodes
- c.  $(k+n)$ -colorable
- d.  $(k^3+n^3+1)$  nodes

57. A binary relation  $R$  on a single set  $A$  is a subset of?

- a.  $A \times A$
- b.  $A \% A$
- c.  $A \wedge A$
- d.  $A ? A$

58. If  $C_n$  is the  $n$ th cyclic graph, where  $n > 3$  and  $n$  is odd. Determine the value of  $X(C_n)$ .

- a. 32572
- b. 16631
- c. 3

d. 310

59. Determine the density of a planar graph with 34 edges and 13 nodes.

a.  $22/21$

b.  $12/23$

c. 328

d. 576

60. A relation  $R$  on set  $A$  is called \_\_\_\_\_ if  $xRy$  implies  $yRx$ .

a. Irreflexive

b. Reflexive

c. Anti-Symmetric

d. Symmetric

61. The relation  $R = \{(a,b), (b,a)\}$  on set  $X = \{a,b\}$  is?

a. Irreflexive

b. Reflexive

c. Anti-Symmetric

d. Symmetric

62. The binary relation  $\{(1,1), (2,1), (2,2), (2,3), (2,4), (3,1), (3,2)\}$  on the set  $\{1, 2, 3\}$  is

\_\_\_\_\_

a. reflexive, symmetric and transitive

b. irreflexive, symmetric and transitive

c. neither reflexive, nor irreflexive but transitive

d. irreflexive and antisymmetric

63. A function can not be?

a. one to one

b. many to one

C. one to many.

d. onto to one

64.  $f: \mathbb{N} \rightarrow \mathbb{N}, f(x) = 5x$  is?

a. injective

b. not injective

C. surjective

d. inverse

65. A function  $f: A \rightarrow B$  is \_\_\_\_\_ (onto) if the image of  $f$  equals its range.

a. injective

b. surjective

C. inverse

d. not surjective

66. If a function is both surjective and injective then it is known as?

a. invertible

b. composition

C. bijective

d. associative

67. If  $f$  and  $g$  are onto then the function  $(g \circ f)$  is?

a. one to one

b. onto

C. one to many.

d. into

68. Which property in functions does not hold?

a. associative property

b. commutative property

C. one-to-one function

d.Both A and B

69. 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.  $6x+3$

d.  $6x+8$

70. which of the following is true?

a. The function  $f(x) = x^3$  is bijection from  $\mathbb{R}$  to  $\mathbb{R}$ .

b. The function  $f(x)=x+1$  from the set of integers to itself is onto.

C. Both A and B

d. The function  $f(X)= x-2$  is onto from  $\mathbb{Z}$  to  $\mathbb{Z}$ .

71. When we perform an experiment, then the set  $S$  of all possible outcomes is called the?

a). Random Experiment

b. Event

C. Sample Space

d. Tossing Space

72. If a coin is tossed, how many possible outcomes?

a. 1

b. 2

C. 3

d. 4

73. When a dice is thrown, What is the probability of any one of the numbers?

a.  $(1/3)$

b.  $(5/6)$

C.  $(2/3)$

d.  $(1/6)$

74. From a deck of 52 cards, if one card is picked find the probability of an ace being drawn?

a.  $(1/26)$

b.  $(1/13)$

C.  $(3/52)$

d.  $(1/52)$

75. From a deck of 52 cards, if one card is picked find the probability of a diamond being drawn?

a.  $(1/4)$

b.  $(3/26)$

C.  $(1/6)$

d.  $(1/13)$

76. Discrete probability distribution depends on the properties of \_\_\_\_\_

a. discrete variables

b. probability function

C. machine

d. data

77. A bag contains 5 red balls and some blue balls. If the probability of drawing a blue ball is double that of a red ball, then the number of blue balls in a bag is:

a. 5

b. 10

C. 15

d. 20

78. There are 30 people in a group. If all shake hands with one another, how many handshakes are possible?

a.870

b.435

c.30!

d.29! + 1

79.How many words can be formed by using all letters of word ALIVE.

a.86

b.95

c.105

d.120

80.A \_\_\_\_\_ in a graph G is a circuit which consists of every vertex (except first/last vertex) of G exactly once.

a. Euler path

b.Hamiltonian path

c. Planar graph

d. Path complement graph

81.A walk has Closed property if \_\_\_\_\_

a.  $v_0 = v_k$

b.  $v_0 \geq v_k$

c.  $v < 0$

d.  $v_k > 1$

82.A trail in a graph can be described as \_\_\_\_\_

a. a walk without repeated edges

b. a cycle with repeated edges

c.a walk with repeated edges

d. a line graph with one or more vertices

83. For every spanning tree with  $n$  vertices and  $n$  edges what is the least number of different Spanning trees can be formed?

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

84. The spanning tree will be maximally acyclic if \_\_\_\_\_

- a. one additional edge makes a cycle in the tree
- b. two additional edges makes a cycle in the tree
- c. removing one edge makes the tree cycle free
- d. removing two edges make the tree cycle free

85. 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

86. 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.  $\{(0,1), (1,1), (2,3), (2,2), (3,4), (3,1)\}$

87. Determine the partitions of the set  $\{3, 4, 5, 6, 7\}$  from the following subsets.

- a.  $\{3,5\}, \{3,6,7\}, \{4,5,6\}$
- b.  $\{3\}, \{4,6\}, \{5\}, \{7\}$
- c.  $\{3,4,6\}, \{7\}$

d.  $\{5,6\}, \{5,7\}$

88. Determine the number of equivalence classes that can be described by the set  $\{2, 4, 5\}$ .

a. 125

b. 5

c. 16

d. 72

89. Which of the following relation is a partial order as well as an equivalence relation?

a. equal to(=)

b. less than(<)

c. greater than(>)

d. not equal to(!=)

90. The relation  $\leq$  is a partial order if it is \_\_\_\_\_

a. reflexive, antisymmetric and transitive

b. reflexive, symmetric

c. asymmetric, transitive

d. irreflexive and transitive

91. 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.  $f(R) = R$

92. Let  $R_1$  and  $R_2$  be two equivalence relations on a set. Is  $R_1 \cup R_2$  an equivalence relation?

a. an equivalence relation

b. reflexive closure of relation

c. not an equivalence relation

d. partial equivalence relation

93. Let A and B be two non-empty relations on a set S. Which of the following statements is false?

a. A and B are transitive  $\Rightarrow A \cap B$  is transitive

b. A and B are symmetric  $\Rightarrow A \cup B$  is symmetric

c. A and B are transitive  $\Rightarrow A \cup B$  is not transitive

d. A and B are reflexive  $\Rightarrow A \cap B$  is reflexive

94. Determine the characteristics of the relation  $aRb$  if  $a^2 = b^2$ .

a. Transitive and symmetric

b. Reflexive and asymmetry

c. Trichotomy, antisymmetry, and irreflexive

d. Symmetric, Reflexive, and transitive

95. \_\_\_\_\_ recursion consists of multiple self-references.

a. binary recursion

b. single recursion

c. multiple recursion

d. coinductive recursion

96. Find the value of  $a_4$  for the recurrence relation  $a_n = 2a_{n-1} + 3$ , with  $a_0 = 6$ .

a. 320

b. 221

c. 141

d. 65

97. solution to the recurrence relation  $a_n = a_{n-1} + 2n$ , with initial term  $a_0 = 2$  are \_\_\_\_\_

a.  $4n+7$

b.  $2(1+n)$

c.  $3n^2$

d.  $5 \cdot (n+1)/2$

98. What is the solution to the recurrence relation  $a_n = 5a_{n-1} + 6a_{n-2}$ ?

a.  $2n^2$

b.  $6n$

c.  $(3/2)^n$

d.  $n! \cdot 3$

99. In which of the following problems recurrence relation holds?

a. Optimal substructure

b. Tower of Hanoi

c. Hallmark substitution

d. Longest common subsequence

100. A graph without loops or parallel edges is called.....

a. Planar.

b. Simple

c. Trivial

d. Bipartite