

B.Sc. Computer Science
Class: SYCS
Combinatorics & Graph Theory
Sample questions

Multiple Choice questions

1)The first step in the naïve greedy algorithm is?

- a.analysing the zero flow
- b.calculating the maximum flow using trial and error
- c.adding flows with higher values
- d.reversing flow if required

2)Under what condition can a vertex combine and distribute flow in any manner?

- a.It may violate edge capacities
- b.It should maintain flow conservation
- c.The vertex should be a source vertex
- d.The vertex should be a sink vertex

3)A simple acyclic path between source and sink which pass through only positive weighted edges is called?

- a.augmenting path
- b. critical path
- c. residual path
- d.maximum path

4)How many constraints does flow have?

- a.one
- b.three
- c.two
- d.four

5)Which algorithm is used to solve a minimum cut algorithm?

- a. Gale-Shapley algorithm
- b. Ford-Fulkerson algorithm
- c. Stoer-Wagner algorithm
- d. Prim's algorithm

6) _____ is a partition of the vertices of a graph in two disjoint subsets that are joined by at least one edge.

- a. Minimum cut
- b. Maximum flow
- c. Maximum cut
- d. Graph cut

7) _____ separates a particular pair of vertices in a graph.

- a. line
- b. arc
- c. cut
- d. flow

8) _____ is a data structure used to collect a system of cuts for solving min-cut problem.

- a. Gomory-Hu tree
- b. Gomory-Hu graph
- c. Dancing tree
- d. AA tree

9) Which one of the following is not an application of max-flow min-cut algorithm?

- a. network reliability
- b. closest pair
- c. network connectivity
- d. bipartite matching

10).....is a simple undirected graph. Some vertices of G are of odd degree. Add a node v to G and make it adjacent to each odd degree vertex of G . The resultant graph is sure to be

- a.regular
- b.Complete
- C.Hamiltonian
- d.Euler

11)given connected graph is a Euler Graph if and only if all vertices of are of

- a.same degree
- b.even degree
- C.odd degree
- d.different degree

12)How many different trees are there with four nodes A, B, C and D ?

- a.30
- b.60
- C.90
- d.120

13)The number of different spanning trees in complete graph, K_4 and bipartite graph, $K_{2,2}$ have _____ and _____ respectively.

- a.14, 14
- b.16, 14
- C.16, 4
- d.14, 4

14)How many diagonals can be drawn by joining the angular points of an octagon?

- a.14
- b.20
- C.21

d.28

15)The number of edges in a 'n' vertex complete graph is ?

a. $n * (n-1) / 2$

b. $n * (n+1) / 2$

C. n^2

d. $n * (n+1)$

16)Node A has three siblings and B is parent of A, what is the degree of A?

a.0

b.3

C.4

d.5

17)How many edges are there in a forest with v vertices and k components?

a. $(v + 1) - k$

b. $(v + 1)/2 - k$

C. $v - k$

d. $v + k$

18)Let G be an arbitrary graph with n nodes and k components. If a vertex is removed from G, the number of components in the resultant graph must necessarily lie down between

a.k and n

b.k-1 and k+1

C.k-1 and n-1

d.k+1 and n-k

19)Graph in which all nodes are of equal degree, is known as

a.Multigraph

b.Non regular graph

C.Regular graph

d.Complete graph

20)In a graph G there is one and only one path between every pair of vertices then G is a

a.Path

b.Walk

c.Tree

d.Circuit

21)G is a graph with e edges and n vertices, the sum of the degrees of all vertices in G is

a.e

b.e/2

C.e²

d.2 e

22)The number of distinct simple graphs with up to three nodes is

a.15

b.10

C.7

d.9

23)In how many ways can 5 red and 4 white balls be drawn from a bag containing 10 red and 8 white balls?

a. ${}^8C_5 \times {}^{10}C_4$

b. ${}^{10}C_5 \times {}^8C_4$

c. ${}^{18}C_9$

d. 8C_4

24)The number of diagonals that can be drawn by joining the vertices of an octagon is

a.28

b.48

C.20

d.30

25) student can take one of four Mathematics sections and one of five English sections. The number n of ways he can register for the two courses, is

a.4

b.5

C.20

d.30

26) Value of n will be

a.3

b.4

C.6

d.9

27) a factory for five jobs the members A, B, C, D, E are eligible.

In how many ways the first two jobs can be filled?

a.20

b.30

C.60

d.120

28) Six teachers and six students have to sit round a circular table such that there is a teacher between any two students. The number of ways in which they can sit is

a. $6! \times 6!$

b. $5! \times 6!$

C. $5! \times 5!$

d. $5! \times 4!$

29) 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

30) a maximum spanning tree the weighted graph is of _____

- a. maximum number of edges
- b. maximum number of cyclic trees
- c. minimum number of vertices
- d. maximum weight

31) Prim's algorithm can be implemented using _____

- a. stack data structure
- b. radix sort
- c. priority queue data structure
- d. bubble sort

32) The problem of finding a path in a graph that visits every vertex exactly once is called?

- a. Hamiltonian path problem
- b. Hamiltonian cycle problem
- c. Subset sum problem
- d. Turnpike reconstruction problem

33) Hamiltonian path problem is _____

- a. NP problem
- b. N class problem
- c. P class problem
- d. NP complete problem

34) Which of the following problems is similar to that of a Hamiltonian path problem?

- a. knapsack problem
- b. closest pair problem
- c. travelling salesman problem
- d. assignment problem

35) In a _____ the vertex set and the edge set are finite sets.

- a. finite graph
- b. bipartite graph
- c. infinite graph
- d. connected graph

36) If G is the forest with 54 vertices and 17 connected components, G has _____ total number of edges.

- a. 38
- b. 37
- c. 17/54
- d. 17/53

37) The number of edges in a regular graph of degree 46 and 8 vertices is _____

- a. 347
- b. 230
- c. 184
- d. 186

38) In an undirected graph the number of nodes with odd degree must be:

- a. odd
- b. prime
- C. even

d. zero

39) If a graph requires k different colours for its proper colouring, then the chromatic number of the graph is

a. 1

b. k

c. $k-1$

d. $k/2$

40) The number of edges in a regular graph of degree d and n vertices is

a. maximum of n and d

b. $n + d$

c. nd

d. $nd / 2$

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

a. Directed

b. Planar

c. Simple

d. Complete

42) A graph without loops or parallel edges is called.....

a. Planar.

b. Simple

c. Trivial

d. Bipartite

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

a. $2n$.

b. n

c.n-1

d.3n

44)A graph is a collection of vertices and.....

a. Vertices

b. Edges

c. Loops.

d.Tree

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

a.Open.

b.Closed

c.Path.

d. Walk

46)The complete graph with four vertices has K edges where K is.....

a.3

b.4

c.5

d.6

47)A graph G is called tree if it is a connected

a.Acyclic graph.

b.Cyclic graph

c.Simple graph.

d.Trivial graph

48)An edge that starts & ends at the same

a.Edge.

b. Vertex

c.loop.

dcyclic

49)An undirected graph has even number of vertices withdegree.

a.Odd

b.Even

c.Positive.

d.Negative

50)A graph with no edges is known as..... graph .

a.Empty.

b.Regular

c Complete.

d.Bipartite.

51)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

52)A connected planar graph having 6 vertices, 7 edges contains _____ regions.

a.15

b. 3

c. 1

d.11

53)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

54) What is the maximum number of edges in a bipartite graph having 10 vertices?

a. 24

b. 21

c. 25

d. 16

55) Which of the following is true?

a. A graph may contain no edges and many vertices

b. A graph may contain many edges and no vertices

c. A graph may contain no edges and no vertices

d. A graph may contain no vertices and many edges

56) 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. $v = e-1$

57) For which of the following combinations of the degrees of vertices would the connected graph be eulerian?

a. 1,2,3

b. 2,3,4

c. 2,4,5

d. 1,3,5

58) A graph with all vertices having equal degree is known as a _____

- a. Multi Graph
- b. Regular Graph
- c. Simple Graph
- d. Complete Graph

59) 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

60) Let G be a complete undirected graph on 6 vertices. If vertices of G are labeled, then the number of distinct cycles of length 4 in G is equal to

- a. 15
- b. 30
- c. 45
- d. 36

61) What is the chromatic number of an n -vertex simple connected graph which does not contain any odd length cycle? Assume $n \geq 2$.

- a. 2
- b. 3
- c. $n-1$
- d. n

62) Which of the following statements is true for every planar graph on n vertices?

- a. The graph is connected
- b. The graph is Eulerian
- c. The graph has a vertex-cover of size at most $3n/4$
- d. The graph has an independent set of size at least $n/3$

63) Let G be the non-planar graph with the minimum possible number of edges. Then G has

a. 9 edges and 5 vertices

b. 9 edges and 6 vertices

c. 10 edges and 5 vertices

d. 10 edges and 6 vertices

64) Which type of graph has all the vertices of the first set connected to all the vertices of the second set?

a. Bipartite

b. Complete Bipartite

c. Cartesian

d. Pie

65) Which graph is also known as biclique?

a. Histogram

b. Complete Bipartite

c. Cartesian

d. Tree

66) Which term defines all the complete bipartite graphs that are trees?

a. Symmetric

b. Anti - Symmetric

c. Circular

d. Stars

67) How many edges does an n vertex triangle free graph contain?

a. n^2

b. $n^2 + 2n$

c. $n^2 / 4$

d.n3

68) Which graph is used to define the claw free graph?

a. Bipartite Graph

b. Simple Graph

c. Star Graph

d. Cartesian Graph

69) Which graph cannot contain $K_{3,3}$ as a minor of graph?

a. Planar Graph

b. Outer Planar Graph

c. Non Planar Graph

d. Inner Planar Graph

70) Complete graph is not present in minor of Outer Planar Graph?

a. $K_{3,3}$

b. $K_{3,1}$

c. $K_{3,2}$

d. $K_{1,1}$

71) Graph is said to be a directed graph if _____ of the graph has direction.

a. 1 branch

b. 2 branches

c. 3 branches

d. every branch

72) The number of branches incident at the node of a graph is called?

a. degree of the node

b. order of the node

c. status of the node

d. number of the node

73) If no two branches of the graph cross each other, then the graph is called?

a. directed graph

b. undirected graph

c. planar graph

d. non-planar graph

74) Number of twigs in a tree are? n - number of nodes

a. n

b. $n+1$

c. $n-1$

d. $n-2$

75) Loops which contain only one link are independent are called?

a. open loops

b. closed loops

c. basic loops

d. positive loops

76) If A represents incidence matrix, I represents branch current vectors, then?

a. $AI = 1$

b. $AI = 0$

c. $AI = 2$

d. $AI = 3$

77) If a graph consists of 5 nodes, then the number of twigs in the tree are?

a. 1

b. 2

c. 3

d. 4

78) If there are 4 branches, 3 nodes then number of links in a co-tree are?

a. 2

b. 4

c. 6

d. 8

79) Boy has nine trousers and 12 shirts. In how many different ways can he select a trouser and a shirt?

a. 21

b. 12

c. 9

d. 108

80) Let G be the non-planar graph with the minimum possible number of edges. Then G has

a. 9 edges and 5 vertices

b. 9 edges and 6 vertices

c. 10 edges and 5 vertices

d. 10 edges and 6 vertices

81) How many three letter words are formed using the letters of the word TIME?

a. 12

b. 20

c. 16

d. 24

82) Using all the letters of the word "THURSDAY", how many different words can be formed?

a. 8

b. 8!

c. $7!$

d. 7

83) Using all the letters of the word "NOKIA", how many words can be formed, which begin with N and end with A?

a. 3

b. 6

c. 24

d. 12

84) A committee has 5 men and 6 women. What are the number of ways of selecting 2 men and 3 women from the given committee?

a. 150

b. 200

c. 250

d. 300

85) What are the number of ways to select 3 men and 2 women such that one man and one woman are always selected?

a. 100

b. 60

c. 30

d. 20

86) A committee has 5 men and 6 women. What are the number of ways of selecting a group of eight persons?

a. 165

b. 185

c. 205

d. 225

87) How many four digit even numbers can be formed using the digits $\{2, 3, 5, 1, 7, 9\}$

a.100

b.360

C.120

d. 240

88)In how many ways can six members be selected from a group of ten members?

a. 6C_4

b. ${}^{10}C_4$

c. ${}^{10}C_5$

d. ${}^{10}P_4$

89)The number of new words that can be formed by rearranging the letters of the word 'ALIVE' is -.

a.24

b.23

c.119

d.120

90)What does Maximum flow problem involve?

a.finding a flow between source and sink that is maximum

b.finding a flow between source and sink that is minimum

C.finding the shortest path between source and sink

d.computing a minimum spanning tree

91)What is the source?

a.Vertex with no incoming edges

b.Vertex with no leaving edges

C.Centre vertex

d.Vertex with the least weight

92) Which algorithm is used to solve a maximum flow problem?

- a. Prim's algorithm
- b. Kruskal's algorithm
- c. algorithm
- d. Ford-Fulkerson algorithm

93) Does Ford-Fulkerson algorithm use the idea of?

- a. Naive greedy algorithm approach
- b. Residual graphs
- c. Minimum cut
- d. Minimum spanning tree

94) The first step in the naive greedy algorithm is?

- a. analysing the zero flow
- b. calculating the maximum flow using trial and error
- c. adding flows with higher values
- d. reversing flow if required

95) Find the maximum flow from the following graph.

- a. 22
- b. 17
- c. 15
- d. 20

96) A simple acyclic path between source and sink which passes through only positive weighted edges is called?

- a. augmenting path
- b. critical path
- c. residual path

d.maximum path

97)How many constraints does flow have?

a.one

b.three

C.two

d.four

98)Ais a subset of vertices such that there exist an edge between any pair of vertices I that subset of vertices.

a.Tree

b.Simple

c.Clique.

d.Trivial.

99) An Euler cycle in a graph G is a simple cycle that passes through every edge of G only

a.Once

b.Twice

c.Thrice.

d.Positive.

100)A graph is a tree if and only if.....

a. Is Planar.

b. Contains circuit

c.Is minimally

d. Is completely connected