**FINALTERM EXAMINATION**
**Spring 2010**
**CS502- Fundamentals of Algorithms (Session - 4)**
**Time: 90 min**
**Marks: 58**

**Question No: 1 ( Marks: 1 ) - Please choose one**

An optimization problem is one in which you want to find,
- ► Not a solution
- ► An algorithm
- ► Good solution
- ► **The best solution**

**Question No: 2 ( Marks: 1 ) - Please choose one**

Although it requires more complicated data structures, Prim's algorithm for a minimum spanning tree is better than Kruskal's when the graph has a large number of vertices.
- ► **True**
- ► False

**Question No: 3 ( Marks: 1 ) - Please choose one**

If a problem is in NP, it must also be in P.
- ► **True**
- ► False
- ► unknown

**Question No: 4 ( Marks: 1 ) - Please choose one**

What is generally true of Adjacency List and Adjacency Matrix representations of graphs?
- ► *Lists* require less space than *matrices* but take longer to find the weight of an edge (v1,v2)
- ► ***Lists* require less space than *matrices* and they are faster to find the weight of an edge (v1,v2)**

▶ *Lists* require more space than *matrices* and they take longer to find the weight of an edge (v1,v2)

▶ *Lists* require more space than *matrices* but are faster to find the weight of an edge (v1,v2)

**Question No: 5 ( Marks: 1 ) - Please choose one**

If a graph has v vertices and e edges then to obtain a spanning tree we have to delete

▶ v edges.

▶ v – e + 5 edges

▶ v + e edges.

▶ **None of these**

**Question No: 6 ( Marks: 1 ) - Please choose one**

Maximum number of vertices in a Directed Graph may be $|V^2|$

▶ **True**

▶ False

**Question No: 7 ( Marks: 1 ) - Please choose one**

The Huffman algorithm finds a (n) _____ solution.

▶ **Optimal**

▶ Non-optimal

▶ Exponential

▶ Polynomial

**Question No: 8 ( Marks: 1 ) - Please choose one**

The Huffman algorithm finds an exponential solution

▶ True

▶ **False**

**Question No: 9 ( Marks: 1 ) - Please choose one**

The Huffman algorithm finds a polynomial solution

▶ True

▶ **False**

**Question No: 10 ( Marks: 1 ) - Please choose one**

The greedy part of the Huffman encoding algorithm is to first find two nodes with **larger** frequency.

► True
► **False**

**Question No: 11 ( Marks: 1 ) - Please choose one**

The codeword assigned to characters by the Huffman algorithm have the property that no codeword is the postfix of any other.

► True
► **False**

**Question No: 12 ( Marks: 1 ) - Please choose one**

Huffman algorithm uses a greedy approach to generate a postfix code T that minimizes the expected length B (T) of the encoded string.

► True
► **False**

**Question No: 13 ( Marks: 1 ) - Please choose one**

Shortest path problems can be solved efficiently by modeling the road map as a graph.

► **True**
► False

**Question No: 14 ( Marks: 1 ) - Please choose one**

Dijkestra's single source shortest path algorithm works if all edges weights are non-negative and there are negative cost cycles.

► True
► **False**

**Question No: 15 ( Marks: 1 ) - Please choose one**

Bellman-Ford allows negative weights edges and negative cost cycles.

► True
► **False**

**Question No: 16 ( Marks: 1 ) - Please choose one**

The term "coloring" came form the original application

which was in architectural design.

► True
► False

**Question No: 17 ( Marks: 1 ) - Please choose one**

In the clique cover problem, for two vertices to be in the same group, they must be adjacent to each other.

► True
► False

**Question No: 18 ( Marks: 1 ) - Please choose one**

Dijkstra's algorithm is operates by maintaining a subset of vertices

► True
► False

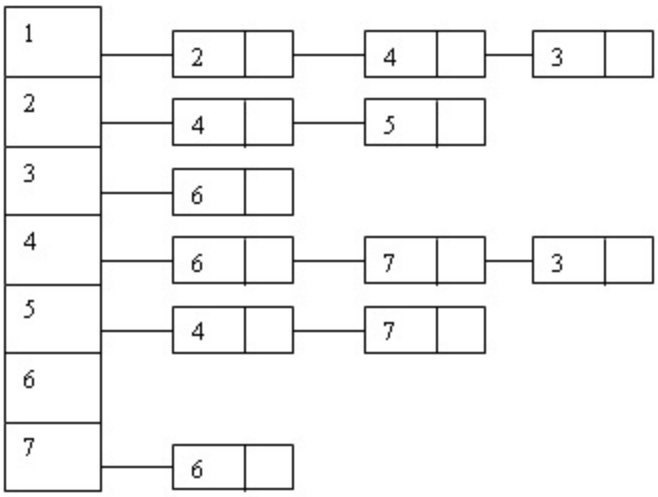
**Question No: 19 ( Marks: 1 ) - Please choose one**

The difference between Prim's algorithm and Dijkstra's algorithm is that Dijkstra's algorithm uses a different key.

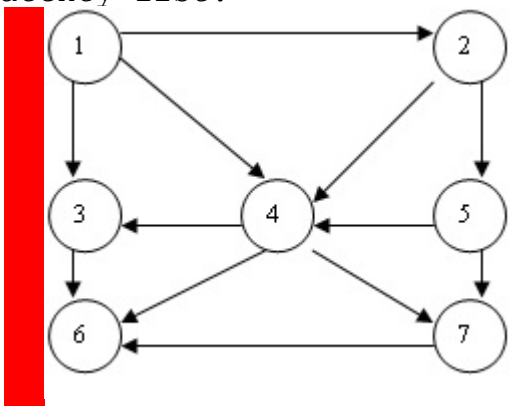
► True
► False

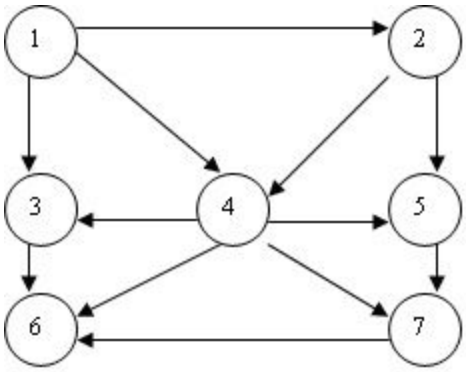
**Question No: 20 ( Marks: 1 ) - Please choose one**

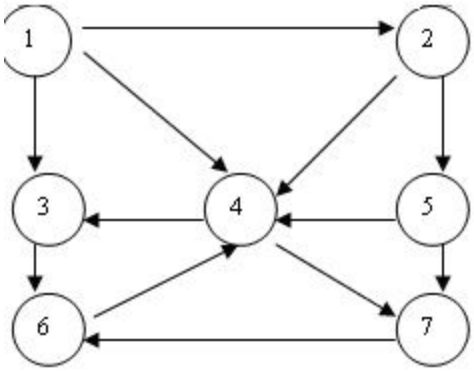
Consider the following adjacency list:

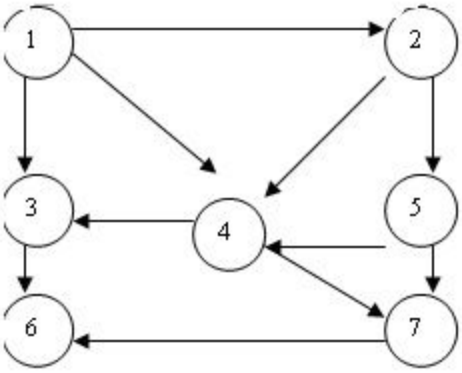


Which of the following graph(s) describe(s) the above adjacency list?






- ▶
- ▶
- ▶

**Question No: 21 ( Marks: 1 ) - Please choose one**

We do sorting to,

- keep elements in random positions
- keep the algorithm run in linear order
- keep the algorithm run in (log n) order
- keep elements in increasing or decreasing order

**Question No: 22 ( Marks: 1 ) - Please choose one**

After partitioning array in Quick sort, pivot is placed in a position such that

- **Values smaller than pivot are on left and larger than pivot are on right**
- Values larger than pivot are on left and smaller than pivot are on right
- Pivot is the first element of array
- Pivot is the last element of array

**Question No: 23 ( Marks: 1 ) - Please choose one**

Merge sort is stable sort, but not an in-place algorithm

- True
- False

**Question No: 24 ( Marks: 1 ) - Please choose one**

In counting sort, once we know the ranks, we simply _____ numbers to their final positions in an output array.

- Delete
- copy
- Mark
- arrange

**Question No: 25 ( Marks: 1 ) - Please choose one**

Dynamic programming algorithms need to store the results of intermediate sub-problems.

- True
- False

**Question No: 26 ( Marks: 1 ) - Please choose one**

A p × q matrix A can be multiplied with a q × r matrix B. The result will be a p × r matrix C. There are (p . r) total

entries in C and each takes _____ to compute.

- O (q)
- O (1)
- O ($n^2$)
- O ($n^3$)

**Question No: 27 ( Marks: 2 )**

Give a detailed example for 2-d maxima problem.

**Question No: 28 ( Marks: 2 )**

Differentiate between back edge and forward edge.

**Question No: 29 ( Marks: 2 )**

How the generic greedy algorithm operates in minimum spanning tree?

**Question No: 30 ( Marks: 2 )**

What are two cases for computing assuming we already have the previous matrix $d^{(k-1)}$ using Floyed-Warshall algorithm?

**Question No: 31 ( Marks: 3 )**

Describe Minimum Spanning Trees Problem with examples.

**Question No: 32 ( Marks: 3 )**

What is decision problem, also explain with example?

**Question No: 33 ( Marks: 3 )**

Prove that the generic TRAVERSE (S) marks every vertex in any connected graph exactly once and the set of edges (v, parent (v)) with parent (v) ¹F form a spanning tree of the graph.

**Question No: 34 ( Marks: 5 )**

Suppose you could reduce an NP-complete problem to a polynomial time problem in polynomial time. What would be the consequence?

**Question No: 35 ( Marks: 5 )**

Prove the following lemma,

**Lemma:** Given a digraph G = (V, E), consider any DFS forest of G and consider any edge (u, v) □ E. If this edge is a tree, forward or cross edge, then f[u] > f[v]. If this edge is a back edge, then f[u] • f[v]

**Question No: 36 ( Marks: 5 )**

What is the cost of the following graph?