CPSC 335-03 — Algo — Exam #1 — Answers   (from Titanium)

335-03 Exam #1
MoWe 7-8:15pm

TOC

1. (8 pts)

Which is the key feature of an Adjacency Matrix for an undirected graph?

Select one:

a. If a cell (x, y) = 1 then cell (y, x) = 1

b. There is a node that has a column of cells with each 0

c. There is a cell (x, x) = 1

d. There is a node that has a row of cells with each 0

e. There is a node that has a column of cells with each 1

f. For N nodes, exactly N cells have a 1

g. If cells (x, y) = 1 and (y, z) = 1, then (x, z) = 1

h. All cells have a 1 in them

i. There is a node that has a row of cells with each 1

j. Only the main diagonal cells have 0

Answers:

If a cell (x, y) = 1 then cell (y, x) = 1   // 100%

2. (8 pts)

Which is a Hamiltonian circuit?

Select one:

○ a. A graph where each node is marked with a color different from its neighbors

○ b. The depth (number of edges) of a graph with only simple nodes

○ c. A path from a source node through each other node to a sink node

○ d. A loop in a graph from one node through the other edges and back

○ e. A path in a graph from a node back to itself that crosses each node exactly once

○ f. A path in a graph from a node back to itself that crosses each edge exactly once

○ g. A treewalk from the root node to each of the other nodes and back

Answers:

A path in a graph from a node back to itself that crosses **each node** exactly once // 100%

Inadequate, but:

A loop in a graph from one node **through the other nodes** and back // 100%

A path in a graph from a node back to itself that crosses **each edge** exactly once // 50%

3. (12 pts)

> Which is the Big-O class for the running time given below?
>
> **3*N^2*cos(3N^3) + 12*N*Log2(N) + N^5*sin(2N^2)/(3*N^3) + 2*N**

Select one:

- a. O(1)
- b. O(N^5)
- c. O((N^2)*LogN)
- d. O((N^5)*sin(N^2))

- e. O(N^3)
- f. O(cos(N^3))
- g. O(N)
- h. O(N^2)

- i. O(2^N)
- j. O(N^4)
- k. O(N*LogN)
- l. O((N^2)*cos(N^3))

Answers:

```
O( N^2 ) // 100%
```

Inadequate, but:

```
O( N*LogN ) // 50%
O( (N^2)*LogN) // 50%
O( N ) // 33%
O( N^3 ) // 33%
O( (N^2)*cos(N^3) ) // 33%
```

4. (12 pts)

For following recurrence relation, which are the Master Theorem's parameter values; the applicable Case number; and the Big-O class?

$$T(N) = 3*T(N/3) + 4N^2 + 2N - 2$$

Select one:

- a. 3,3,2; Case I; O(N^2)
- b. 2,2,2; Case I; O(N^2)
- c. 3,2,4,2,-2; Case IV; O(N^3 * Log(N))
- d. 3,3,4; Case III; O(N^4)

- e. 4,2,2; Case II; O(N^2)
- f. 3,2,4; Case III; O(N^3)
- g. 3,3,2; Case III; O(N^3)
- h. 3,3,4; Case II; O(N^4 * Log(N))
- i. 3,3,4; Case III; O(N^4)

Answers:

```
3,3,2; Case I; O( N^2 ) // 100%
```

Inadequate, but:

```
2,2,2; Case I; O( N^2 ) // 50%
3,3,2; Case III; O( N^3 ) // 33%
3,3,4; Case II; O( N^4 * Log(N) ) // 17%
3,3,4; Case III; O( N^4 ) // 17%
```

5. (12 pts)

Which is the greatest common divisor of 24 and 92: i.e., GCD(24, 92)?

Select one:

a. 23	e. 9	i. 36
b. 20	f. 42	j. 3
c. 46	g. 4	k. 1
d. 12	h. 2	l. 28

Answers:

    4 // 100%

Inadequate, but:

    20 // 50%

A:(% 92 24) (% 24 20) (% 20 4) 0

6. (6 pts)

Which kind of graph would be used to describe stones on the ground and birds in the sky where the only links are between stones and birds?

Select one:

- ○ a. Acyclic
- ○ b. Complete
- ○ c. Subgraph
- ○ d. Clique

- ○ e. Reciprocal
- ○ f. Bipartite
- ○ g. Directed
- ○ h. Connected

- ○ i. Planar
- ○ j. 2-Colored
- ○ k. DAG

Answers:

Bipartite // 100%

Inadequate, but:

2-Colored // 75%

7. (4 pts)

What type of graph contains no path from a node along edges back to itself?

Select one:

- a. Complete
- b. Bipartite
- c. 2-Colored
- d. Directed
- e. Planar
- f. Subgraph
- g. Connected
- h. Clique
- i. Acyclic
- j. Reciprocal
- k. DAG

Answers:

Acyclic // 100%

Inadequate, but:

DAG // 50%

8. (12 pts)

Which of the following Big-O running times are intractable?

Select one or more:

- a. O(Log(LogN))
- b. O(N^(1/LogN))
- c. O(N/LogN)
- d. O((N^2)*LogN)
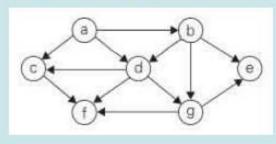- e. O(N^(LogN))
- f. O(N)
- g. O(N!)
- h. O(2^N!)
- i. O(N^(2/N))
- j. O(2^N)
- k. O(LogN)
- l. O(N*LogN)
- m. O(2^9)
- n. O(1)

Answers:

```
O(N!) // 25%
O(2^N!) // 25%
O(2^N) // 25%
O(N^(LogN)) // 25%
```

Inadequate, but:

```
O(1)  // -10% ...
```

9. (14 pts)

For the given graph, show the list of visited nodes in order for a DFS traversal using node A as the starting node, and assuming that the kids of a visited node are to be visited in alphabetical order.

Answer: [_____]

Answers:

    a b d c f g e // 100%

Inadequate, but:

    a b d c f * // 70% 9.8 pt

    a b d c * // 50%

    a b d * // 40%

    a b * // 20%

10. (4 pts)

How are Big-O and Big-Omega most often related?

Select one:

○   a. Big-O is > Big-Omega

○   b. Big-O is unrelated to Big-Omega

○   c. Big-O is < Big-Omega

○   d. Big-O is == Big-Omega

Answers:

Big-O is > Big-Omega // 100%

Inadequate, but:

Big-O is == Big-Omega // 30%

11. (4 pts)

How are Big-O and Big-Theta related, when present?

Select one:

- ○ a. Big-O is < Big-Theta
- ○ b. Big-O is == Big-Theta
- ○ c. Big-O is > Big-Theta
- ○ d. Big-O is unrelated to Big-Theta

Answers:

Big-O is == Big-Theta // 100%

Inadequate, but:

Big-O is unrelated to Big-Theta // 30%

12. (4 pts)

How are Big-Omega and Big-Theta related, when present?

Select one:

○   a. Big-Omega is < Big-Theta

○   b. Big-Omega is > Big-Theta

○   c. Big-Omega is unrelated to Big-Theta

○   d. Big-Omega is == Big-Theta

Answers:

   Big-Omega is == Big-Theta // 100%

Inadequate, but:

   Big-Omega is unrelated to Big-Theta // 30%

13. (12 pts)

For a Knapsack Problem of size 5 (5 items), what is the approximate running time in seconds of its brute-force algorithm if one sum-of-items operation takes 1 second, and you need only one such sum for each pass?

Select one:

- a. 1
- b. 36
- c. 16
- d. 2
- e. 72

- f. 4
- g. 12
- h. 6
- i. 48
- j. 32

- k. 24
- l. 8
- m. 96
- n. 64

Answers:

32 // 100%

Inadequate, but:

16 // 30%

24 // 67%

36 // 75%

48 // 30%

14. (12 pts)

For Selection Sort, given the following array of elements with the Head comprising elements indexed 0 through 1 (on the left) and the Tail being elements indexed 2 through the end. List the nine element sequence of the modified array resulting from the next pass of the algorithm.

3 9 43 27 38 82 50 10 12

Answer: _____

Answers:

3 9 **10** 27 38 82 50 **43** 12 // 100%

Inadequate, but:

3 9 10 // 50%

3 9 // 25% 3pt

3 9 43 **10** 38 82 50 **27** 12 // 50% swapped next guy

3 9 10 **43** 27 38 82 50 **43** 12 // 50% forgot guy to swap out