Activity 8 - Practice Final

Due Jun 2 at 12pm **Points** 20 **Questions** 15 **Available** Jun 2 at 10am - Jun 2 at 12:59pm about 3 hours
Time Limit 30 Minutes **Allowed Attempts** 2

This quiz was locked Jun 2 at 12:59pm.

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	30 minutes	19 out of 20

Answers will be shown after your last attempt

Score for this attempt: **19** out of 20

bmitted Jun 2 at 11:18am

is attempt took 30 minutes.

Question 1 — 1 / 1 pts

An an approximation algorithm with an approximation ratio of 2 is always twice as fast as the original algorithm.

- True

False

Question 2

1 / 1 pts

The greedy method can be a good technique to use when designing an approximation algorithm.

True

False

Incorrect

Question 3

0 / 1 pts

Approximation algorithms are used to solve NP-complete decision problems.

True

False

Question 4

1 / 1 pts

Which of the following graph algorithms can be used to create a polynomial-time 2-approximation algorithm for the traveling salesman problem?

- ( ) DFS
- ( ) BFS
- ( ) Shortest Path
- (•) MST
- ( ) None of the above

Question 5

1 / 1 pts

Select all of the following statements about the bin packing problem that are true?

- [x] The decision version of the bin packing problem is in NP-complete
- [x] The set-partition problem can reduce to the decision version of the bin packing problem.
- [ ] There exists a 1-approximation polynomial time algorithm for the bin packing problem.
- [ ] The decision version of the bin packing problem is in P.

- [x] First-Fit is a 2-approximation algorithm for the bin packing problem.

Question 6

1 / 1 pts

You are using a polynomial time 2-approximation algorithm to find a tour t for the traveling salesman problem. Which of the following statements is true.

- ○ The tour t is never optimal.
- ● The cost of tour t is at most twice the cost of the optimal tour.
- ○ The cost of tour t is always 2 times the cost of the optimal tour.
- ○ The ratio of the cost of the optimal tour divided by the cost of tour t is 2.
- ○ All of the above

Question 7

1 / 1 pts

Given a weighted directed graph G = (V,E,w) and a shortest path P from s to t, if we doubled the weight of every edge to produce G'=(V,E,w'), then P is also a shortest path in G'.

True

False

Question 8

1 / 1 pts

Every problem in P can be reduced to HAM-CYCLE,

True

Every problem in P is in NP, and every problem in NP can be reduced to any NP-complete problem. Circuit-SAT is NP-complete.

False

Question 9

1 / 1 pts

Every problem in P can be reduced to 3-SAT,

True

Every problem in P is in NP, and every problem in NP can be reduced to any NP-complete problem. Circuit-SAT is NP-complete.

False

Question 10

1 / 1 pts

Is the following a property that holds for all non decreasing positive functions f and g? (True=Yes/False=No)

If $f(n) = O(n^2)$ and $g(n) = \Theta(n^2)$, then $f(n) = O(g(n))$.

True

False

Question 11

2 / 2 pts

Let G be a graph with n vertices and m edges. Assume that the graph is represented by an adjacency matrix. What is the tightest upper bound on the running time of DFS performed on G?

O(n^2)

- O(m+n)
- O(mn)
- O(m)
- O(n)

Question 12

2 / 2 pts

Solve the following recurrence by giving the tightest bound possible.

$$T(n) = 2T(\frac{n}{5}) + \sqrt{n}$$

- $\Theta\left(n\right)$
- $\Theta\left(\sqrt{n}\right)$
- $\Theta\left(n^2\right)$
- $\Theta(nlgn)$
- $\Theta\left(n^5\right)$

None of the above

Question 13

2 / 2 pts

```
Testing(n) {
  total = 0
  if n = 1 return 2
  else {
      total = Testing(n/4) + Testing(n/4)
      for i = 1 to n do
            for k = 1 to n do
                 total = total + k
       return total  }
}
```

Write a recurrence for the running time T(n) of Testing(n)

- $T(n) = T(n/4) + n$
- $T(n) = T(2n/4) + n^2$

- ◉ $T(n) = 2T(n/4) + n^2$
- ○ $T(n) = 2T(n/4) + n$
- ○ None of the above

Question 14

2 / 2 pts

Let $f(n) = n^3$

Let $g(n) = n^2 \log(n^3)$

What is the asymptotic relation between f(n) and g(n)? **Check all that apply.**

- [ ] f(n) = O(g(n))
- [x] f(n) = Omega(g(n))
- [ ] f(n) = Theta(g(n))
- [ ] g(n) = Theta(f(n))
- [x] g(n) = O(f(n))
- [ ] g(n) = Omega(f(n))

Question 15

2 / 2 pts

My friend said she discovered a new algorithm AVERR to calculate the average value of a list of n distinct integers. Which of the following statements about the algorithm must be false.

- ○ The worst case running time is O(n^2)
- ○ The best case running time is Omega(lgn)
- ◉ The worst case running time is Theta(ln(n))
- ○ The average case running time is O(n)
- ○ None of the above

Quiz Score: **19** out of 20