DAA Theory | End-sem Exam

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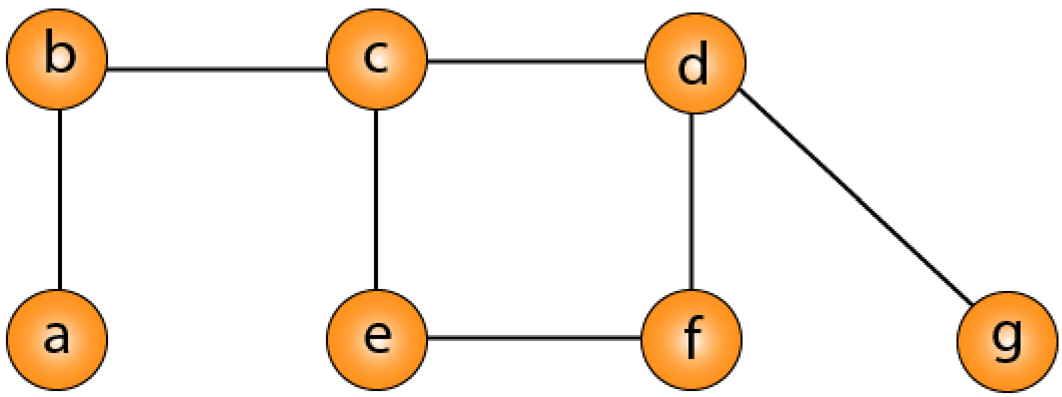
Find the possible vector cover in the below mentioned graph.



- {b,c,d,e,f,g}
- {a, e, d, g}
- {e,f}
- {c,g}

Clear selection

Let T(m) and S(m) are running time of an algorithm with input size 'm' where T(m) is worst case and S(m) is average case running time respectively. What is correct based on this?

(A). $S(m) = \Omega(T(m))$

(B). $S(m) = \Theta(T(m))$

(C). $S(m) = O(T(m))$

(D). $S(m) = o(T(m))$

- ○ A
- ○ B
- ◉ C
- ○ D

Clear selection

What is the best-case running time of the following algorithm? Array A of n integers is an input to the algorithm.

```
for j = 2 to A.length
    key = A[j]
    // Insert A[j] into the sorted sequence A[1 .. j - 1].
    i = j - 1
    while i > 0 and A[i] > key
        A[i + 1] = A[i]
        i = i - 1
    A[i + 1] = key
```

- ○ O(log n)
- ◉ O(n)
- ○ O(n log n)
- ○ O(n^2)

Clear selection

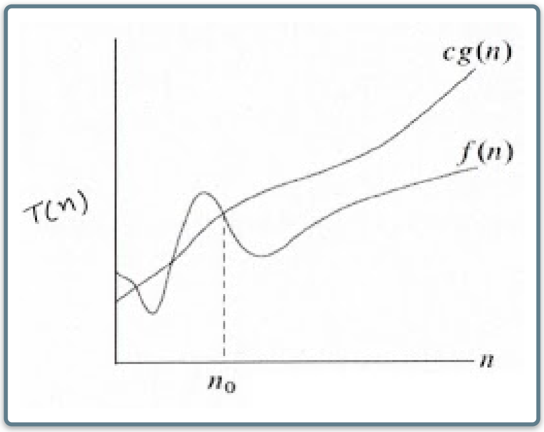
Consider the problem of scheduling the lectures in a classroom. Given that a lecture j starts at sj and finishes at fj, and the the goal is to find the minimum number of classrooms to schedule all lectures, so that no two occur at the same time in the same room.

task J	Start time S_j	finish time f_j	time required
A	0	2	2
B	3	7	4
C	4	7	3
D	9	11	2
E	7	10	3
F	1	5	4
G	6	8	2

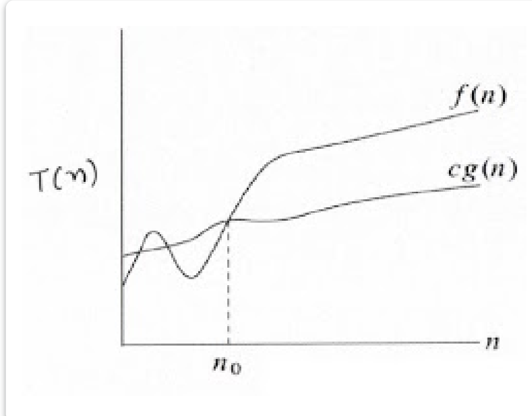
- (selected) 3
- 5
- 4
- 7

Clear selection

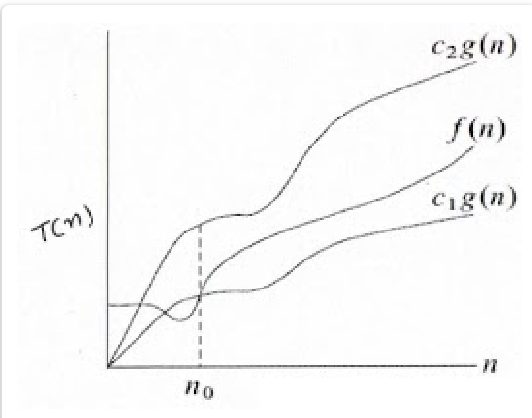
Which of the following represents that f(n) = O(g(n))? [Not: O man Big-oh]



Option 1



Option 2



Option 3

All of the above

Clear selection

Fill up the empty space in the following code:

```
MergeSort(A, p, r):
    if ________
        return
    q = (p+r)/2
    mergeSort(A, p, q)
    mergeSort(A, q+1, r)
    merge(A, p, q, r)
```

- ○ p<r
- ○ p==r
- ◉ p>r
- ○ p!=r

Clear selection

Let c>3/2, which of the following statements is TRUE for large values of n?

A) $O\left(n^{\frac{3}{2}}\right) < O(n) < O(n^c) < O(c^n)$

B) $O\left(n^{\frac{3}{2}}\right) < O(n) < O(c^n) < O(n^c)$

C) $O(n) < O\left(n^{\frac{3}{2}}\right) < O(n^c) < O(c^n)$

D) $O(n) < O\left(n^{\frac{3}{2}}\right) < O(c^n) < O(n^c)$

- ○ A
- ○ B
- ◉ C
- ○ D

Clear selection

State True or False

(1). $(\log n)^{1/2} = O(\log\log n)$

(2). $2^{2n} = O(2^n)$

(A). TRUE, TRUE

(B). TRUE, FALSE

(C). FALSE, TRUE

(B) FALSE, FALSE

- ○ A
- ○ B
- ◉ C
- ○ D

Clear selection

Comment on following statements:

S1: Any two real numbers can be compared.

S2: All functions are asymptotically comparable.

S3: For any two functions f(n) and g(n), it is possible that neither $f(n)=O(g(n))$ nor $f(n)=\Omega(g(n))$.

(A). S1 and S2 is true and S3 is false

(B). S1, S2, and S3 all are false

(C). S1, S2, and S3 all are true

(D). S1 and S3 true and S2 is false

- [x] A
- [ ] B
- [ ] C
- [ ] D

Clear selection

If T(n) = n^2 + 5 * n + 7, then T(n) = ______________.

- [ ] O(n)
- [ ] O(n * log n)
- [x] O(n^2)
- [ ] O(1)

Clear selection

Suppose T(n) = n√n. Consider the following statements. a) T(n) is O(n^3) b) T(n) is O(nlogn)

- (selected) Only a) correct
- Only b) correct
- Both a) and b) corect
- Neither a) nor b) correct

Clear selection

The following functions are arranged as per their growth from slowest growing function to the fastest growing function. Which of the following is incorrect?

- (selected) n, n^(1.1), n * log n, n^2
- log n, n * log n, n^2, 2^n
- n, n * log n, n^(1.1), n^2
- 1, n^2, (3/2)^n , 2^n

Clear selection

What is the worst-case running time of the following algorithm? Array A of n integers is an input to the algorithm.

```
for j = 2 to A.length
    key = A[j]
    // Insert A[j] into the sorted sequence A[1..j-1].
    i = j - 1
    while i > 0 and A[i] > key
        A[i + 1] = A[i]
        i = i - 1
    A[i + 1] = key
```

- ○ O(n log n)
- ○ O(n)
- ◉ O(n^2)
- ○ O(log n)

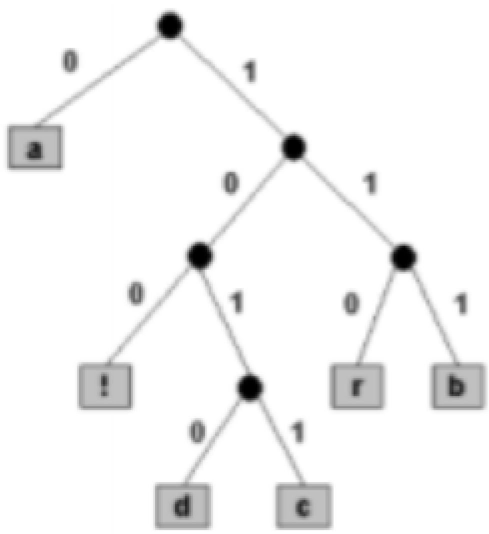
Clear selection

Given items as {value, weight} pairs {{66,23}, {45,20}, {15,4}}. The capacity of knapsack=35. Find the maximum value output assuming items to be divisible and nondivisible respectively.

- ◉ 99, 81
- ○ 90, 60
- ○ 126, 81
- ○ 111, 60

Clear selection

Consider the tree shown in the figure here. It _______ represent a prefix code.



- [ ] does not
- [x] does
- [ ] cannot be predicted whether it does or it does not

Clear selection

You are given a rod of length 5 and the prices of each length are as follows:

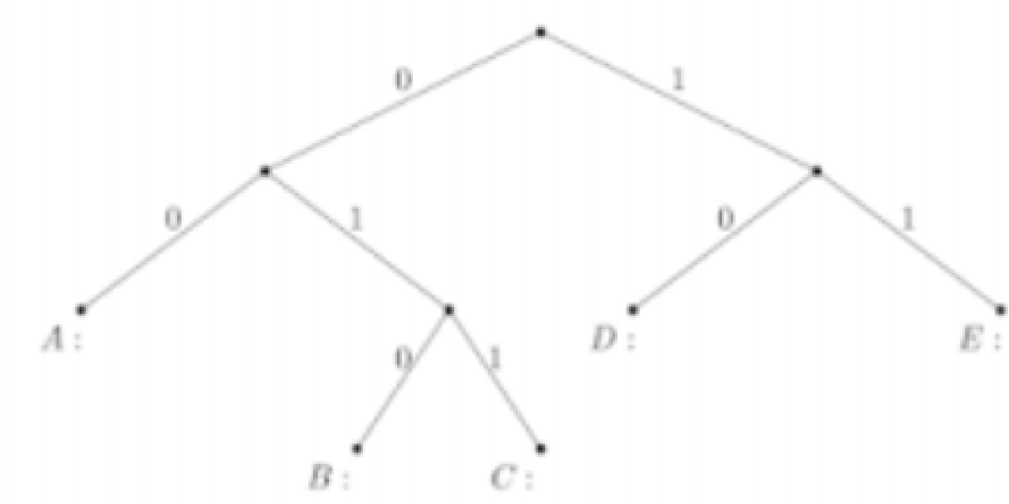
length	price
1	2
2	5
3	6
4	9
5	9

Calculate the maximum value that you can get after cutting the rod and selling the pieces?

- (selected) 12
- 10
- 11
- 13

Clear selection

Consider the tree shown in the figure here. Given that it encodes the character string as shown below, the characters encoded are _________. Encoding - 000100111010011



- ○ ABDEBC
- ◉ ABCDDC
- ○ ABDDDB
- ○ ABDDDC

Clear selection

The minimum number of scalar multiplications required to calculate a matrix-chain product of dimensions (70, 120, 90, 30, 60, 100, 50, 90, 10) is

- ○ 3,30,000
- ○ 4,55,000
- ◉ 3,92,000
- ○ 3,81,000

Clear selection

Which of the following algorithms follows divide and conquer strategy?

- (●) Merge sort
- ( ) Selection sort
- ( ) Insertion sort
- ( ) Heap sort

Clear selection

The best-case running time of binary search algorithm is ______________.

- ( ) O(n log n)
- ( ) O(n)
- (●) O(log n)
- ( ) O(1)

Clear selection

Consider a typical Activity Selection problem. The activities pool as in the A1, A2,...,A12 need to use the same resource. Their start and finish times are as shown, in the figure here. Then, ________ is the maximum number of activities that can be completed without having conflicts in this schedule is ________.

Activity	A_1	A_2	A_3	A_4	A_5	A_6	A_7	A_8	A_9	A_{10}	A_{11}	A_{12}
Start T	1	3	2	6	6	8	4	4	9	10	2	7
Finish T	6	5	7	8	9	9	7	7	12	14	5	10

- ○ 5
- ○ 3
- ◉ 4
- ○ 2

Clear selection

The recurrence relation of a merge sort is ____________________.

$$T(n) = T\left(\frac{n}{2}\right) + C$$

Option 1

$$T(n) = T\left(\frac{n}{2}\right) + O(n)$$

Option 2

$$T(n) = 2T\left(\frac{n}{2}\right) + C$$

Option 3

$$T(n) = 2T\left(\frac{n}{2}\right) + O(n)$$

Option 4

Clear selection

In the worst-case, the number of swaps required to sort n elements using selection sort is ________________.

- ○ O(n)
- ○ O(log n)
- ○ O(n log n)
- ◉ O(n^2)

Clear selection

What is the worst-case running time of Max-Heapify algorithm?

- ○ O(n log n)
- ○ O(1)
- ○ O(n)
- ◉ O(log n)

Clear selection

The recurrence relation of a binary search is ______________.

$$T(n) = T\left(\frac{n}{2}\right) + C$$

- [x] Option 1

$$T(n) = T\left(\frac{n}{2}\right) + O(n)$$

- [ ] Option 2

$$T(n) = 2T\left(\frac{n}{2}\right) + C$$

- [ ] Option 3

$$T(n) = 2T\left(\frac{n}{2}\right) + O(n)$$

- [ ] Option 4

Clear selection

To sort the following list in ascending order using insertion sort, how many times elements have to be shifted from their positions? {40, 14, 70, 57, 38, 27}

- ○ 7
- ○ 9
- ◉ 10
- ○ 8

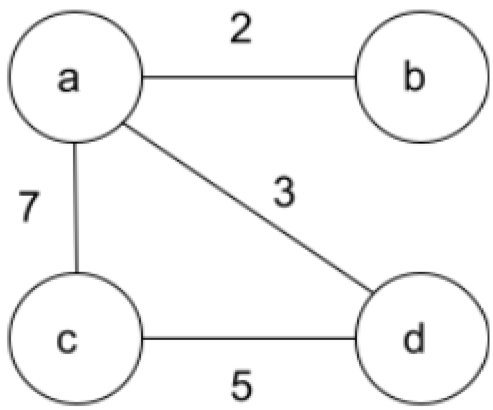
Clear selection

The worst-case running time of binary search algorithm is ______________.

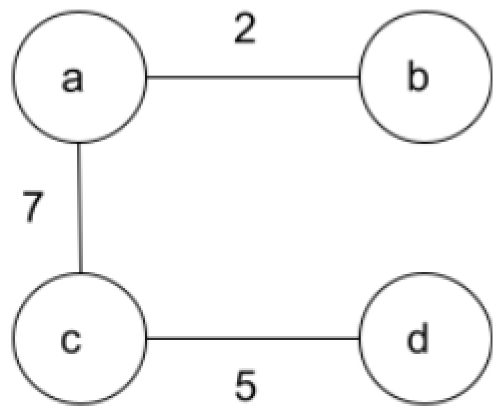
- ○ O(1)
- ○ O(n log n)
- ○ O(n)
- ◉ O(log n)

Clear selection

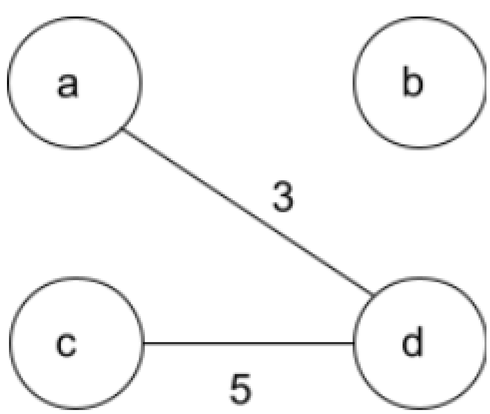
One of the spanning tree of the graph shown in the figure is ____, whereas its one of the MST is ____



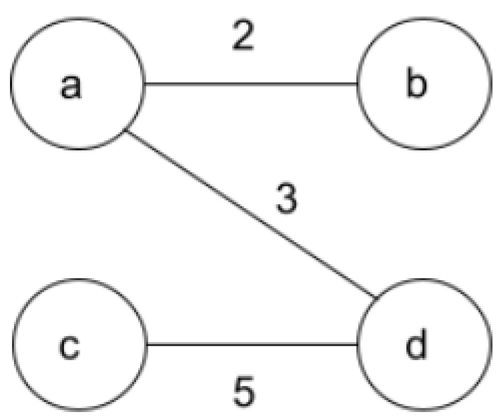
Graph G



Graph G1



Graph G2



Graph G3

- G3, G2
- G3, G1
- G1, G2
- G1, G3

If we will be able solve satisfiability problem in Polynomial time then travelling salesperson problem can also be solved in polynomial time

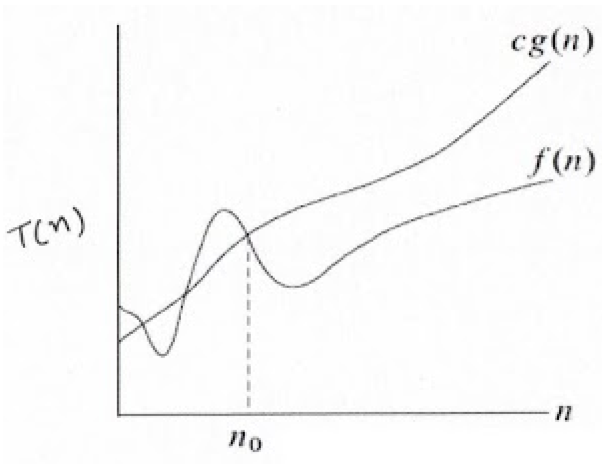
- ◯ True
- ◯ Insufficient Information
- ◯ Can't Say
- ◯ False

If T(n) = 5 * n^2, then T(n) = _____________.

- ◯ O(n^2)
- ◯ O(n^2 * log n)
- ◯ O(n^3)
- ◉ All of the above

Clear selection

Given a figure, which of the following relations is correct?



- ○ O(f(n)) = g(n)
- ◉ f(n) = O(g(n))
- ○ O(g(n)) = f(n)
- ○ g(n) = O(f(n))

Clear selection

NP-complete problems are the hardest problems in NP.

- ○ Insufficient Information
- ○ False
- ○ True
- ○ Can't Say

Which of the following statements is correct?

$$\lim_{n \to \infty} \frac{f(n)}{g(n)} = 0$$

- ◯ Function f grows faster than function g as input n approaches infinity.
- ◯ Function g grows faster than function g as input n approaches infinity.
- ◯ Function f and g grows at the same rate as input n approaches infinity.
- ◉ None of the above

Clear selection

If f(n) = log n and g(n) = n, then ____________.

- ◯ The function f(n) grows faster than g(n) when n approches infinity.
- ◉ The function f(n) grows slower than g(n) when n approches infinity.
- ◯ The function f(n) and g(n) grow at the same rate when n approches infinity.
- ◯ None of the above

Clear selection

What is the time complexity for below recurrence relation?

$$T(n) = T(\sqrt{n}) + c$$

- ○ O(n^2)
- ○ O(log n)
- ○ O(n)
- ◉ O(log log n)

Clear selection

Which data structure is used in dijkstra's shortest path algorithm on weighed graph to implement it in linear time?

- ◉ Queue
- ○ Stack
- ○ Heap
- ○ B-tree

Clear selection

Let an array A = {11, 9, 17, 19, 22, 26, 6, 14}. Which of the following options represents the partially sorted array after the first four passes of the insertion sort?

- [x] {6, 9, 11, 14, 17, 19, 22, 26}
- [ ] {9, 11, 17, 19, 22, 26, 6, 14}
- [ ] {9, 11, 19, 17, 22, 26, 6, 14}
- [ ] None of the above

Clear selection

The best-case running time of linear search algorithm is ______________.

- [x] O(1)
- [ ] O(n log n)
- [ ] O(n)
- [ ] O(log n)

Clear selection

A decision problem A is NP-complete if

- [ ] Only (a)
- [x] Both (a) and (b)
- [ ] Every problem in NP is reducible to A in polynomial time
- [ ] A is in NP

Clear selection

After ___________ try, we can find the existence of an element in a sorted array containing 1000 elements using binary search.

- ○ 31.6227
- ○ 1000
- ◉ 10
- ○ 100

Clear selection

The worst-case running time of linear search algorithm is _______________.

- ◉ O(n)
- ○ O(n^2)
- ○ O(n log n)
- ○ O(log n)

Clear selection

Based on the definitions of asymptotic notations what can be inferred from the below statement:

"Algorithm-1 is asymptotically efficient than Algorithm-2".

(A). For all input Algorithm-1 will be a better choice

(B). For all input Algorithm-1 will be a better choice except possibly small inputs

(C). For all input Algorithm-1 will be a better choice except possibly large inputs

(D). Algorithm-2 will be a better choice for all small inputs

- A
- B
- C
- D

Solve: $T(n) = 2T(n/2) + \sqrt{3}$

- (selected) $\Theta(n)$
- $\Theta(\sqrt{n})$
- $\Theta(\sqrt{n} \log\sqrt{n})$
- $\Theta(\sqrt{n} \log n)$

Clear selection

Which of the following complexity class is not solvable in polynomial time but verifiable in polynomial time?

- P Class
- NP Class
- NP Complete
- All of the above

Which of the following statements is correct?

$$\lim_{n \to \infty} \frac{f(n)}{g(n)} = \infty$$

- (selected) Function f grows faster than function g as input n approaches infinity.
- Function g grows faster than function f as input n approaches infinity.
- Function f and g grows at the same rate as input n approaches infinity.
- None of the above

Clear selection

Consider the following two sequences :

A = < Q, R, S, R, P, Q, R >, and
B = < R, P, S, Q, R, Q >

Find the length of longest common subsequence of A and B.

- (•) 4
- ( ) 5
- ( ) 2
- ( ) 3

Clear selection

Given the following recurrence relation of an algorithm, what is the running time of the algorithm?

$$T(n) = 2T\left(\frac{n}{2}\right) + O(n)$$

- ( ) O(n)
- ( ) O(log n)
- ( ) O(1)
- (•) O(n * log n)

Clear selection

If $f(n) = 2n + 5$ and $g(n) = 3n - 2$, then ____________.

- ◯ The function f(n) grows faster than g(n) when n approches infinity.
- ◯ The function f(n) grows slower than g(n) when n approches infinity.
- ◉ The function f(n) and g(n) grow at the same rate when n approches infinity.
- ◯ None of the above

Clear selection

Let T(n) be a function defined by the recurrence. $T(n) = 4T(n/4) + \sqrt{n}$ for $n>=4$ and $T(1) = 1$. Which of the following statement is TRUE?

- ◯ $T(n) = \Theta(n)$
- ◯ $T(n) = \Theta(\sqrt{n})$
- ◯ $T(n) = \Theta(n \log n)$
- ◯ $T(n) = \Theta(\log n)$

Consider the selection sort algorithm for sorting n numbers. The maximum number of swaps possible are __________.

- ◯ 1
- ◯ n^2
- ◉ n-1
- ◯ n

Clear selection

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