TEST

ALGORITHMS (PART 2)

Time: 45 min.

Directions for questions 1 to 30: Select the correct alternative from the given choices.

1. The worst case running time of an algorithm means
(A) The algorithm will never take any longer.
(B) The algorithm will take less time than running time
(C) The algorithm will run in a finite time
(D) None of the above

2. Analyzing an algorithm involves
(A) Evaluating the complexity
(B) Validating the Algorithm
(C) Both A and B
(D) None of the above

3. $f(n) = \theta(g(n))$ is
(A) $g(n)$ is asymptotic lower bound for $f(n)$
(B) $g(n)$ is asymptotic tight bound for $f(n)$
(C) $g(n)$ is asymptotic upper bound for $f(n)$
(D) None of the above

4. Which case yields the necessary information about an algorithm's behaviour on a random input?
(A) Best-case (B) Worst-case
(C) Average-case (D) Both A and C

5. Algorithms that require an exponential number of operations are practical for solving.
(A) Only problems of very small size
(B) Problems of large size
(C) Problems of any size
(D) None of these

6. Problems that can be solved in polynomial time are called
(A) Tractable (B) Decidable
(C) Solvable (D) Computable

7. Problems that cannot be solved at all by any algorithm are known as
(A) Tractable (B) Undecidable
(C) Untractable (D) Unsolvable

8. Which of the following problems is decidable but intractable?
(A) Hamiltonian circuit (B) Traveling sales man
(C) Knapsack problem (D) All the above

9. Which method is used to solve recurrences?
(A) Substitution method
(B) Recursion-tree method
(C) Master method
(D) All the above

10. Consider the following
(i) Input
(ii) Output
(iii) Finiteness
(iv) Definiteness means clear and unambiguous
(v) Effectiveness

Which of the following is not a property of an algorithm?
(A) (iv) only (B) (iv) and (v) only
(C) (iii) and (iv) only (D) None of the above

11. Finiteness of an algorithm means
(A) The steps of the algorithm should be finite
(B) The algorithm should terminate after finite time
(C) Algorithm must terminate after a finite number of steps
(D) Algorithm should consume very less space

12. Asymptotic analysis on efficiency of algorithm means
(A) The efficiency of the algorithm on a particular machine
(B) How the running time of an algorithm increases as the size increases without bound
(C) How efficiently the algorithm is applied to solve a problem without thinking of input size.
(D) None of the above

13. What is the input size of a problem?
(A) Number of variables used to solve the problem
(B) Number of constants used to solve the problem
(C) it is problem specific that is in case of graph it is number of edges and vertices and so on.
(D) None of these

14. (i) An algorithm must take input
(ii) An algorithm must give out put
Which is true in the following options?
(A) (i) Only (B) (ii) Only
(C) (i) and (ii) Only (D) None of the above

15. As $n\ \theta°$
Which of the following is efficient?
(A) $\theta(n^3)$ (B) $\theta(n^2)$
(C) $\theta(2^n)$ (D) $\theta(n^4)$

16. Suppose
$T_1(n) = O(f(n))$
$T_2(n) = O(f(n))$
which of the following is true,.
(A) $T_1(n) + T_2(n) = O(f(n))$ (B) $\frac{T_1(n)}{T_2(n)} = 0(1)$
(C) $T_1(n) = 0(T_2(n))$ (D) None of these

17. The following program computes $n!$

Find the complexity?

Input: A non-negative integer

Output: Value of $n!$

If $n = 0$ return 1

Else return $F(n-1)\ \theta n$

(A) $\theta(n)$ (B) $\theta(n \log n)$

(C) $\theta(n^2)$ (D) $\theta(n^3)$

18. Which of the following functions are often referred as 'exponential growth function'?

(A) 2^n, $\log n$ (B) 2^n, $n!$

(C) $n!$, $n \log n$ (D) $n!$, $\log n$

19. Consider the following code

```
sort (a, n)
{
    for i = 1 to n do
    {
          j = i;
    for k = i + 1 to n do
          if (a[k] < a [j]) then j = k;
          t = a[i];
          a[i] = a[j];
          a[j] = t;
          }
    }
```

The above code implements which sorting?

(A) Merge sort

(B) selection sort

(C) Insertion sort

(D) Radix sort

20. Assume that the number of disks in a 'Towers of Hanoi problem' is 'n', with '3' towers, Initially all disks are placed on tower 1, to get the largest disk are placed on tower 1, to get the largest disk to the bottom of 2nd tower, How many moves are required? ($\theta n = 3$)

(A) n

(B) $(n-1)$

(C) $(n+1)$

(D) $2n$

21. Each new term in Fibonacci sequence is obtained by taking the sum of the two previous terms. The first term of the sequence is $f_0 = 0$, and the second term $f_1 = 1$. Which of the following gives Fibonacci sequence?

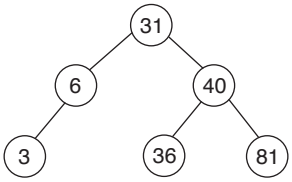
(A) $f_n = f_{n+1} + f_{n-2},\ n \geq 2$

(B) $f_n = f_{n-1} + f_{n-2},\ n \geq 2$

(C) $f_n = f_{n-1} + f_{n+1},\ n \geq 2$

(D) All the above

22. Consider the binary search tree



Delete node '31', what would be the parent node in the new binary search tree?

(A) 36

(B) 40

(C) 81

(D) 6

23. Consider the given array [4, 6, 7, 8, 21, 9, 3, 10, 13, 16, 31] after performing '1' delete max operation, on the max heap. What would be the sequence of elements in the array?

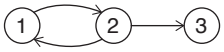
(A) 9, 21, 13, 16, 3, 7, 10, 8, 4, 6

(B) 21, 9, 13, 16, 7, 3, 10, 8, 4, 6

(C) 21, 9, 13, 16, 3, 7, 10, 8, 4, 6

(D) 21, 9, 13, 16, 7, 3, 10, 4, 8, 6

24. Consider the given Di-graph

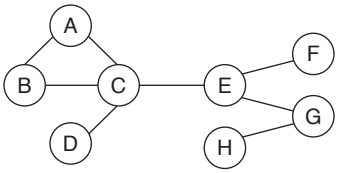


How many strongly connected components does the above graph contain?

(A) 1 (B) 2

(C) 3 (D) many

25. Consider the given graph



Which of the following shows the adjacency matrix of the above graph?

(A)

	A	B	C	D	E	F	G	H
A	0	1	1	0	0	0	0	0
B	1	0	1	0	0	0	0	0
C	1	1	0	1	1	0	0	0
D	0	0	1	0	0	0	0	0
E	0	0	1	0	0	1	1	0
F	0	0	0	0	1	0	0	0
G	0	0	0	0	1	0	0	1
H	0	0	0	0	0	0	1	0

(B)

	A	B	C	D	E	F	G	H
A	0	1	1	0	0	0	0	0
B	1	0	1	0	0	0	0	0
C	1	1	0	1	1	0	0	0
D	0	0	1	0	0	0	0	0
E	0	0	1	0	0	1	1	0
F	0	0	**0**	0	1	0	0	0
G	0	0	0	0	1	0	0	1
H	0	0	0	0	1	0	1	0

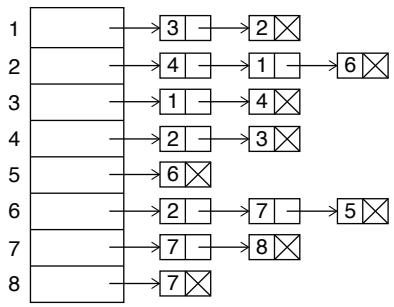
(C)

	A	B	C	D	E	F	G	H
A	0	1	1	0	0	0	0	0
B	1	0	1	0	0	0	0	0
C	1	1	0	1	1	0	0	0
D	0	0	1	0	0	0	0	0
E	0	0	1	0	0	1	1	0
F	0	0	**0**	0	1	0	0	0
G	0	0	0	0	0	1	0	1
H	0	0	0	0	0	0	1	0

(D)

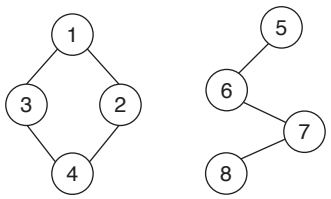
	A	B	C	D	E	F	G	H
A	0	1	1	0	0	0	0	0
B	1	0	1	0	0	0	0	0
C	1	1	0	1	1	0	0	0
D	0	0	1	0	0	0	0	0
E	0	0	1	0	0	1	1	0
F	0	0	**0**	0	1	0	0	0
G	0	0	0	0	1	0	0	1
H	0	0	0	0	1	1	0	1

26. Consider the given adjacency list

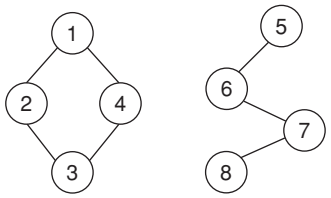


The above list is representation of which of the following graph?

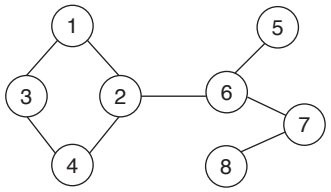
(A)



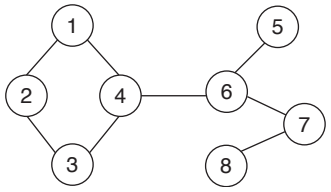
(B)



(C)



(D)



27. Which of the following is FALSE?

(A) In dynamic programming an optimal sequence of decisions is obtained by making explicit appeal to the principle of optimality

(B) In greedy method only one decision sequence is generated.

(C) In dynamic programming, many decision sequences may be generated.

(D) In greedy method many decision sequences are generated.

28. Consider an array $a[n]$ of 'n' numbers that has '$n/2$' distinct elements and '$n/2$' copies of another element, to identify that repeated element, how many steps are required in the worst case?

(A) $n/2$ (B) $n/2 + 1$

(C) $n/2 + 2$ (D) n

29. Match the following, for a very large value of 'n'

I. $36n^3 + 2n^2$

II. $5n^2 - 6n$

III. $n^{1.001} + n \log n$

P. $\theta(n^2)$

Q. $\mid (n^3)$

R. $\theta(n^{1.001})$

(A) I – P, II – Q, III – R (B) I – Q, II – P, III – R

(C) I – R, II – Q, III – P (D) I – R, II – P, III – R

30. Consider the following code

```
        T(a, n)
{
   for i = 1 to n - 1 do
      for j = i + 1 to n do
            {
                  t = a[i, j];
                  a[i, j] = a[j, i];
                  a[j, i] = t;
            }
   }
```

The above code performs
(A) Matrix multiplication
(B) Matrix addition
(C) Matrix transpose
(D) Matrix chain multiplication

Answers Keys

1. A	**2.** C	**3.** B	**4.** C	**5.** A	**6.** A	**7.** B	**8.** D	**9.** D	**10.** D
11. C	**12.** D	**13.** C	**14.** B	**15.** B	**16.** A	**17.** A	**18.** B	**19.** A	**20.** C
21. B	**22.** A	**23.** B	**24.** B	**25.** A	**26.** C	**27.** D	**28.** C	**29.** B	**30.** C