

1. Some software tools used in developing computer programs are
    - A> Text editors
    - B> Compilers & assemblers
    - C> Operating systems & debugging programs
    - D> All of the above
    - E> None of the above
  
  2. Software specifications tell exactly \_\_\_\_\_ a program will do, but not \_\_\_\_\_ it will do it
    - A> What, how
    - B> When, why
    - C> It, then
    - D> All of the above
    - E> None of the above
  
  3. Ways to make ur programs readable & easily understood are:
    - A> Use of comments & self-documenting code
    - B> Pretty printing & constants
    - C> Avoidance of tricky code
    - D> All of the above
    - E> None of the above
  
  4. What is the first step in developing any software program?
    - A> System design
    - B> System study
    - C> Coding
    - D> Think
    - E> None of the above
  
  5. Example(s) of O (N) algorithms is(are)
    - A> Printing a character to the screen
    - B> Incrementing a variable
    - C> Adding two no.s together
    - D> All of the above
    - E> None of the above
  
  6. Example(s) of O (N) algorithm is(are)
    - A> Initializing all of the elements in a one-dimensional array to zero
    - B> Incrementing all the elements in a one-dimensional array
    - C> Multiplying two numbers by performing successive addition operations
    - D> All of the above
    - E> None of the above
  
  7. Examples (s) of O (N<sup>2</sup>) algorithms is (are)
    - A> Initializing all the elements in a two-dimensional array to zero
    - B> Printing out all the elements in a two-dimensional array
    - C> Searching for the smallest element in an unsorted two-dimensional array
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- D> All of the above
- E> None of the above

8. Three algorithms do the same task. Algorithm 1 is  $O(\sqrt{N})$ , Algorithm 2 is  $O(N)$  & Algorithm 3 is  $O(\log_2 N)$ . Which algorithm should execute the fastest for large values of  $N$ ?

- A>  $O(\sqrt{N})$
- B>  $O(N)$
- C>  $O(\log_2 N)$
- D> None of the above

9. Which of the following algorithm should execute the slowest for large values of  $N$ ?

- A>  $O(\sqrt{N})$
- B>  $O(N)$
- C>  $O(\log_2 N)$
- D> None of the above

10. What should never be found in the top level of a top-down design?

- A> Details
- B> Coding
- C> Decisions
- D> All of the above
- E> None of the above

11. Which of the following is(are) an example(s) of data abstraction?

- A> List of student information
- B> File of employee records
- C> Bank account database
- D> All of the above
- E> None of the above

12. Describe Process Program File in terms of Big-O, if  $N$  refers to the number of lines in the program file

- A>  $O(N)$
- B>  $O(1)$
- C>  $O(\log_2 N)$
- D>  $O(N^2)$
- E> None of the above

13. Describe Line Status of the Process Program File in terms of Big-O, if  $N$  refers to the number of lines in the program file

- A>  $O(N)$
- B>  $O(1)$
- C>  $O(\log_2 N)$
- D>  $O(N^2)$
- E> None of the above

14. A syntax error

- A> Is an error in the use of the programming language, & will most likely be found at compile time, if it has not been detected by visual inspection of the program

- B> Is an error in how the programs works, & will most likely be detected at run time, by causing the program to crash or to produce wrong results**
- C> Is an error that occur during the execution of a program. These are often result of the programmer's making to many assumptions**
- D> None of the above**

**15. A logical error**

- A> Is an error in the use of the programming language, & will most likely be found at compile time, if it has not been detected by visual inspection of the program**
- B> Is an error in how the programs works, & will most likely be detected at run time, by causing the program to crash or to produce wrong results**
- C> Is an error that occur during the execution of a program. These are often result of the programmer's making to many assumptions**
- D> None of the above**

**16. Run time error**

- A> Is an error in the use of the programming language, & will most likely be found at compile time, if it has not been detected by visual inspection of the program**
- B> Is an error in how the programs works, & will most likely be detected at run time, by causing the program to crash or to produce wrong results**
- C> Is an error that occur during the execution of a program. These are often result of the programmer's making to many assumptions**
- D> None of the above**

**17. Data Encapsulation means that**

- A> The separation of the representation of data from the applications that use the data at a logical level**
- B> The logical picture of a data type, plus the specifications of the operations required to create & manipulate object of this data type**
- C> A collection of data elements whose organization is characterized by accessing operations that are used to store & retrieve the individual data elements.**
- D> None of the above**

**18. Data Structure means**

- A> The separation of the representation of data from the applications that use the data at a logical level**
- B> The logical picture of a data type, plus the specifications of the operations required to create & manipulate objects of this data type**
- C> A collection data elements whose organization is characterized by accessing operations that are used to store & retrieve the individual data elements**
- D> All of the above**
- E> None of the above**

**19. Abstract data type means that**

- A> The separation of the representation of data from the applications that use the data at a logical level**
- B> The logical picture of a data type, plus the specifications of the operations required to create & manipulate objects of this data type**
- C> A collection data elements whose organization is characterized by accessing operations that are used to store & retrieve the individual data elements**

- D> All of the above
- E> None of the above

20. The structured data types that are built in to Pascal are:

- A> Arrays & records
- B> Variant records
- C> Sets & Files
- D> All of the above
- E> None of the above

21. Evaluate the following prefix expression  $+ * 2 + / 14 2 5 1$

- A> 23
- B> 24
- C> 25
- D> 37
- E> None of the above

22. Evaluate the following prefix expression  $- * 6 3 - 4 1$

- A> 25
- B> 15
- C> 23
- D> 12
- E> None of the above

23. Base case

- A> Is a nonrecursive exit from the recursive routine
- B> Is a path that includes a recursive call to the routine, to solve a smaller version of the the original problem
- C> Is a structure that keeps track of the activation records at run time, in order to preserve the values of parameters, return address, registers, & so on
- D> Refers to the point in the compile/execution cycle when variable names are associated with address in memory
- E> None of the above

24. Recursive case

- A> Is a non recursive exit from the recursive routine
- B> Is a path that includes a recursive call to the routine, to solve a smaller version of the original problem
- C> Is a structure that keeps track of the activation records at run time, in order to preserve the values the parameters, return addresses, registers & so on
- D> Refers to the point in the compile/execution cycle when variable names are associated with addresses in memory
- E> None of the above

25. Binding time

- A> Is a non recursive exit from the recursive routine
- B> Is a path that includes a recursive call to the routine, to solve a smaller version of the original problem
- C> Is a structure that keeps track of the activation records at run time, in order to preserve the values the parameters, return addresses, registers & so on

- D> Refers to the point in the compile/execution cycle when variable names are associated with addresses in memory
- E> None of the above

**26. Run-time stack**

- A> Is a non recursive exit from the recursive routine
- B> Is a path that includes a recursive call to the routine, to solve a smaller version of the original problem
- C> Is a structure that keeps track of the activation records at run time, in order to preserve the values the parameters, return addresses, registers & so on
- D> Refers to the point in the compile/execution cycle when variable names are associated with addresses in memory
- E> None of the above

**27. Tail recursion**

- A> Occurs when the recursive call is the last statement executed in a recursive procedure or function
- B> Is a path that includes a recursive call to the routine, to solve a smaller version of the original problem
- C> Is a structure that keeps track of the activation records at run time, in order to preserve the values the parameters, return addresses, registers & so on
- D> Refers to the point in the compile/execution cycle when variable names are associated with addresses in memory
- E> None of the above

**28. What data structure would U most likely see in a nonrecursive implementation of a recursive algorithm?**

- A> Link list
- B> Queue
- C> Stack
- D> Trees
- E> None of the above

**29. What is the maximum total number of nodes in a tree that has N levels? Note that the root is level (zero)**

- A>  $2^{2N}$
- B>  $2^{N+1}-1$
- C>  $2^N-1$
- D>  $2^N-2N$
- E> None of the above

**30. How many ancestors does a node in the Nth level (root level=0) of a binary search tree have?**

- A> N
- B> N+1
- C>  $2^N$
- D>  $2^N+1$
- E> None of the above

**31. How many different binary trees can be made from three nodes that contain the key values 1,2 & 3?**

- A> 30
- B> 20
- C> 10
- D> 5
- E> None of the above

32. How many different binary search trees can be made from three nodes that contain the key values 1,2 & 3?

- A> 30
- B> 20
- C> 10
- D> 15
- E> None of the above

33. Insert New Question

- A>
- B>
- C>
- D> All of the above
- E> None of the above

34. The best average behavior is shown by

- A> Quick sort
- B> Merge sort
- C> Heap sort
- D> Insert sort
- E> None of the above

35. The worst-case behavior of Quick sort is \_\_\_\_\_.

36. The Quick sort algorithm requires a maximum of \_\_\_\_\_ stack space in the worst case.

37. The average number of comparisons in sequential search is

- A>  $n^2$
- B>  $n(n-1)/2$
- C>  $n(n+1)/2$
- D>  $(n+1)/2$
- E> None of the above

38. Which of the following is false?

- A>  $100 n \log n = O[n \log n / 100]$
- B>  $\sqrt{\log n} = O(\log \log n)$
- C> If  $0 < x < y$  then  $n^x = O(n^y)$
- D>  $2^n \neq O(n^k)$
- E> None of the above

39. Consider the following statement:-

- i) First-in-first out types of computations are efficiently supported by STACKS
- ii) Implementing LISTS on linked lists is more efficient than implementing LISTS on an array for almost all the basic LIST operations
- iii) Implementing Queues on a circular array is more efficient than implementing queues on a linear array with two indices
- iv) Last-in-first out type of computations are efficiently supported by Queues

- A) (ii) & (iii)
- B) (i) & (ii)
- C) (iii) & (iv)
- D) (ii) & (iv)

40. An advantage of chained hash table (external hashing) over the open addressing scheme is

- A> Worst case complexity of search operations is less
- B> Space used is less
- C> Deletion is easier
- D> All of the above
- E> None of the above

41. Relative mode of addressing is most relevant to writing

- A> Co-routines
- B> Position-independent code
- C> Sharable code
- D> Interrupt handlers
- E> None of the above

42. The minimum no of interchanges needed to convert the array 89, 19, 40, 17, 12,10,2,5,7,11,6,9,70 into a heap with the maximum element at the root is

- A> 0
- B> 1
- C> 2
- D> 3
- E> None of the above

43. The average no. of key comparisons done in a successful sequential search in a list of length  $n$  is

- A>  $\log n$
- B>  $(n-1)/2$
- C>  $n/2$
- D>  $(n+1)/2$
- E> None of the above

44. A binary search tree is generated by inserting in order the following integers:

50,15,62,5,20,58,91,3,8,37,60,24.

The number nodes in the left sub-tree & right sub-tree of the root respectively is

- A> (4,7)
- B> (7,4)
- C> (8,3)
- D> (3,8)

E> None of the above

45. Quick sort is run on two inputs shown below to sort in ascendant order

i) 1,2,3...n

ii) n,n-1,n-2,.....2,1

Let C1 & C2 be the no. of comparisons made for the inputs (i) & (ii) respectively.

Then

A> C1<C2

B> C1>C2

C> C1=C2

D> We cannot say anything for arbitrary  $n$ .

E> All of the above

F> None of the above

46. Heap allocation is required for languages

A> That support recursion

B> That support dynamic data structures

C> That use dynamic scope rules

D> All of the above

E> None of the above

47. Locality of reference implies that the page reference being made by a process

A> Will always be to the page used in the previous page reference

B> Is likely to be one of the pages used in the last few page references

C> Will always be to one of the pages used in the last few page references

D> Will always lead to a page fault

E> None of the above

48. The correct matching for the following pairs is

a) Disk scheduling (1) Round robin

b) Batch processing (2) SCAN

c) Time sharing (3) LIFO

d) Interrupt Processing (4) FIFO

A>a-3,b-4,c-2,d-1

B>a-4,b-3,c-2,d-1

C>a-2,b-4,c-1,d-3

D>a-3,b-4,c-3,d-2

49. A binary search tree contains the values 1,2,3,4,5,6,7,8. The tree is traversed in pre-order & the values are printed out. Which of the following sequences is a valid output?

A> 5 3 1 2 4 7 8 6

B> 5 3 1 2 6 4 8 7

C> 5 3 2 4 1 6 7 8

D> 5 3 1 2 4 7 6 8

E> None of the above



50. A priority queue Q is used to implement a stack S that stores characters. PUSH (1) is implemented as INSERT (Q,C,K) where K is an appropriate integer key chosen by the implementation. POP is implemented as DELETE MIN(Q). For a sequence of operations the keys chosen are in
- A>Non-increasing order
  - B>Non-decreasing order
  - C>Strictly increasing order
  - D>Strictly decreasing order
  - E>None of the above.

**Answer Sheet for question no. TOTSOL-ALGO-01**

- 1. d
- 2. a
- 3. d
- 4. d
- 5. d
- 6. d
- 7. d
- 8. c
- 9. b
- 10. a
- 11. d
- 12. a
- 13. b
- 14. a
- 15. b
- 16. c
- 17. a
- 18. c
- 19. b
- 20. d
- 21. c
- 22. b
- 23. a
- 24. b
- 25. d
- 26. c
- 27. a
- 28. c
- 29. b
- 30. a
- 31. a

- 32. d
- 33. a
- 34. a
- 35.  $O(n^2)$
- 36.  $O(n)$
- 37. d
- 38. a
- 39. d
- 40. c
- 41. d
- 42. c
- 43. b
- 44. b
- 45. a
- 46. b
- 47. a
- 48. e
- 49. d
- 50. c