Number of Questions: 35   **Section Marks: 30**

Directions for questions 1 to 35: Select the correct alternative from the given choices.

1. Consider the following C program
```
main ()
{
char c = 'i'
while (c++ < = 'p')
putchar (xyz);
}
```
What should replace '*xyz*' such that the output will be: ijklmnop
(A) c
(B) c – 1
(C) c++
(D) – c

2. Which of the following is/are true regardless of implementations?
   I. sizeof(short) equals sizeof(int)
   II. sizeof(int) equals sizeof(unsigned)
   III. sizeof(double) is not less than sizeof(float)
   (A) I only
   (B) II and III
   (C) I and II
   (D) I, II and III

3. Consider the following type definition:
   typedef char c[10];
   c Array [6];
   What will be the sizeof(Array)?
   (Assume one character occupies 1 byte)
   (A) 16 bytes
   (B) 60 bytes
   (C) 10 bytes
   (D) 30 bytes

4. For implementing stack using linked list, the push and pop operations are performed as
   (A) Push after the last element, pop the last element
   (B) Push in front of the first element, pop the last element
   (C) Push in front of the first element, pop the first element
   (D) Push after the last element, pop the first element

5. Which of the following tree traversals have worst case complexity more than linear time?
   (A) Level order
   (B) Preorder
   (C) Inorder
   (D) None of the above

6. The stack is not used to implement:
   (A) Level order
   (B) infix
   (C) Polish
   (D) Reverse Polish

7. Which of the following data structures has the least height
   (A) B–tree of order 4
   (B) B–tree of order 3
   (C) B–tree of order 5
   (D) B–tree of order 6

8. Which one of the following algorithm solves the positive weighted single source shortest path problem?
   (A) Breadth first search
   (B) Depth first search
   (C) Kruskal's algorithm
   (D) Dijkstra's algorithm

9. The minimum spanning tree problem uses:
   (A) Breadth first search
   (B) Dijkstra's algorithm
   (C) Kruskal's algorithm
   (D) Depth first search

10. Heap allocation is required for languages that:
    (A) support dynamic data structures
    (B) support recursion
    (C) use dynamic scope rules
    (D) None of the above

11.
```
# include <stdio.h>
int main ( )
{
extern int X;
x = 40;
printf ("%d", X);
}
```
    (A) 0
    (B) 40
    (C) Error
    (D) Garbage value

12. Forward declaration is absolutely necessary:
    (A) if the function call precedes its definition
    (B) if the function call precedes its definition and the function returns a non-integer quantity
    (C) if a function returns a non-integer quantity
    (D) None of the above

13. Faster access to non-local variable is achieved using an array of pointers to activation records is called a/an:
    (A) Queue
    (B) Stack
    (C) Heap
    (D) Activation tree

14. A binary tree *T* has 64 leaf nodes. The number of nodes of degree 2 in *T* is:
    (A) 64
    (B) $\log_2 64$
    (C) 63
    (D) 32

15. The number of leaf nodes in a rooted tree of 10 nodes with each node having 0 or 3 children is:
    (A) 4
    (B) 5
    (C) 6
    (D) 7

16. Consider the following C code segment
```
main()
{
static int i;
while(printf("%d",printf("hi")))
{
printf ("by");
if (i == 2)
break;
else
i++;
}
}
```
    The output will be:
    (A) hi2bybyby
    (B) hi2byhi2byhi2by
    (C) hi2byhi2byhi2byhi2by
    (D) Syntax error

17. Consider the following for loop
for (putchar('*G*'); putchar (0);putchar ('*E*'))
putchar ('*T*');
The above loop will be executed
(A) Infinite times (B) 2 times
(C) 0 time (D) Syntax error

18. Consider below code fragment:
```
Test (list, n)
Nodeptr *list;
int n;
{
    Nodeptr  p, q;
    int m;
    q = NULL;
    p = *list;
    while (p! = NULL)
      if(p ® info = = n)
      {
         p = p → next;
         if(q = = NULL)
      {
         freenode(*list);
         *list = p;
      }
      else
         deleteafter(q, &m);
      }
      else
      {
         q = p;
         p = p → next;
      }
    }
```
deleteafter (*q*, & *m*) next node after *q* will be deleted and deleted data will be stored in *m*. freenode (*list) frees a node. Then what is the function of Test?
(A) Deletes first and last elements of the list.
(B) Deletes all nodes whose 'info' field contains the value '*n*'.
(C) Deletes all nodes whose next 'info' field contains the value '*n*'.
(D) Delete '*n*' nodes from the list.

19. What is the output of the following?
enum coin {penny, nickel, dime, quarter = 25, half –
dollar, dollar}; printf ("%d %d", dime, dollar);
(A) 2,5 (B) 2,27
(C) 3,27 (D) 2,25

20. Convert the given infix expression into post fix
$A - B * C + (D / E) * F / G$
(A) $ABC * - DE / F * G / +$
(B) $ABC * - DE / FG * / +$
(C) $ABC * - DE / + F * G /$
(D) $ABC * - DE / + FG / *$

21. What will be the output of the following C code?
```
# define square(x) (x * x)
int main ( )
{
```

```
int i, j = 3
i = square(j+2)
printf("%d", i);
}
```
(A) Error (B) 25
(C) 11 (D) None of the above

22. What will be the output of the following *C* code segment?
```
# define function(i, j) i##j
main ( )
{
int var1 = 10, var12 = 30;
printf("%d",function(var1, 2));
}
```
(A) Error (B) 30
(C) 0 (D) 12

23. Which of the following sequence of array elements form a valid binary min-heap?
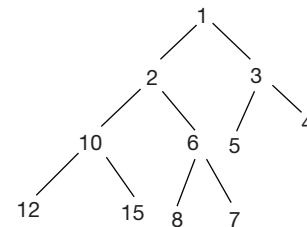(A) 4, 7, 10, 8, 9, 12, 13
(B) 23, 25, 28, 24, 32, 30
(C) 14, 17, 25, 30, 15, 24, 33
(D) 60, 80, 70, 65, 85, 90, 95

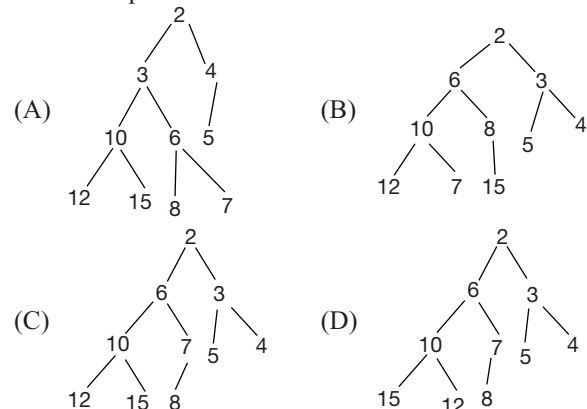**24.** Construct a binary max heap with elements 4, 14, 3, 6, 9, 5, 10, 12, 7, 8 inserted inorder
Which of the following is the correct sequence of element of binary max-heap in the array, representation
(A) 14, 12, 10, 9, 8, 3, 5, 7, 4, 6
(B) 14, 12, 10, 9, 8, 3, 5, 4, 7, 6
(C) 14, 12, 10, 8, 9, 5, 3, 4, 7, 6
(D) 14, 12, 10, 8, 9, 4, 3, 5, 7, 6

25. Consider the following min-heap

On deleting the element '1' from the min-heap, the resultant heap will be?

26. The inorder and preorder transversal of binary tree are *l j m i n k o* and *i j l m k n o* respectively. Then the post-order traversal of the binary tree is:
(A) *m l j o n k i*   (B) *m l j n o k i*
(C) *l m n o j k i*   (D) *l m j n o k i*

27. How many distinct binary search trees can be created out 'n' distinct keys?
(A) *n*!   (B) n^2
(C) $\dfrac{2nC_n}{n+1}$ (D) $2n + 1$

28. Find the maximum number of nodes in a binary tree of height 13? (height of a binary tree is the maximum number of edges in any root to leaf path)
(A) $2^{12} - 1$ (B) $2^{14} - 1$
(C) 2^{13} (D) 2^{14}

29. The following sequence of operations is performed on a stack push(30), push(40), pop, push(30), push(40), pop, pop, pop, push(40), push(30), pop, pop
What is the sequence of popped out values?
(A) 40, 40, 30, 40, 30, 30
(B) 30, 40, 40, 30, 40, 30
(C) 40, 40, 30, 30, 30, 40
(D) 40, 30, 40, 30, 30, 40

Common Data Questions 30 and 31:
```
Consider the function
find(int i, int j)
{
return ((i <j) ? 0 : (i - j));
}
```
30. Let *a*, *b* be two non-negative integers. The call find (*a*, find(*a*, *b*)) can be used to find the:
(A) Positive difference of *a*, *b*
(B) Maximum of *a*, *b*
(C) Minimum of *a*, *b*
(D) Sum of *a*, *b*

31. Let *a*, *b* be two non-negative integers, then which of the following calls, finds the positive difference of *a* and *b*?
(A) find(*a*, *b*) + find(*b*, *a*)   (B) *a* + find(*a*, *b*)
(C) *b* + find(*a*, *b*)   (D) find(*a*, find(*a*, *b*))

Linked Data Questions 32 and 33:
Consider the following C code fragment
```
static char array [4][4] =
{"bat", "tub", "hot", "pig"};
char (*p) [4] = array;
```
32. What will be the output of ($*$ (array [2] + 1))
(A) Prints address of 'o'   (B) Prints 'u'
(C) Prints 'h'   (D) Prints o

33. Which of the following prints the character 'g'?
(A) putchar ($*$(ptr + 3)+2)
(B) putchar ($*$($*$(ptr + 3)+2))
(C) putchar ($*$((array +3) + 2))
(D) Both (B) and (C)

Linked Data Questions 34 and 35:
A binary search tree is generated by inserting the elements in the following order:
20, 25, 30, 15, 18, 12, 35, 8, 23, 5, 13

34. Which one of the following is the valid preorder transversal on the above binary search tree?
(A) 20, 15, 12, 8, 5, 13, 18, 23, 25, 30, 35
(B) 20, 15, 12, 8, 5, 13, 18, 35, 25, 23, 30
(C) 20, 15, 12, 8, 5, 13, 18, 25, 23, 30, 35
(D) 20, 15, 12, 8, 5, 13, 18, 25, 30, 23, 35

35. Which one of the following is the valid post order transversal on the binary search tree?
(A) 5, 8, 13, 12, 18, 15, 23, 35, 25, 30, 20
(B) 5, 8, 13, 12, 18, 15, 23, 25, 30, 20, 35,
(C) 5, 8, 13, 12, 18, 23, 15, 25, 30, 35, 20
(D) 5, 8, 13, 12, 18, 15, 23, 35, 30, 25, 20

Answer Keys

1. B	**2.** B	**3.** B	**4.** C	**5.** D	**6.** A	**7.** D	**8.** D	**9.** C	**10.** A
11. C	**12.** B	**13.** D	**14.** C	**15.** D	**16.** B	**17.** C	**18.** B	**19.** B	**20.** A
21. C	**22.** B	**23.** A	**24.** B	**25.** C	**26.** D	**27.** C	**28.** B	**29.** C	**30.** C
31. A	**32.** D	**33.** D	**34.** C	**35.** D					

Hints and Explanations

3. $10 \times 6 = 60$ bytes   Choice (B)

5. All the other options requires linear time only
                                        Choice (D)

6. Polish → preorder
Reverse polish → post order
Level order → BFS   Choice (A)

11. Output of the given program will be "Linker error – undefined symbol X"
External variables are declared outside a function.
                                        Choice (C)

12. By default the return type is int.
                                        Choice (B)

14. No. of nodes of degree $2 = n - 1$
where n – no. of leaf nodes   Choice (C)

15. $\lceil 2n + 1)/3 \rceil$

$\left\lceil \dfrac{2 \times 10 + 1}{3} \right\rceil = \left\lceil \dfrac{21}{3} \right\rceil = 7$ Choice (D)

18. Given code deletes all nodes whose 'info' field contains 'n'. If the 'info' field equal to n delete that node and repeat this for the remaining list.   Choice (B)
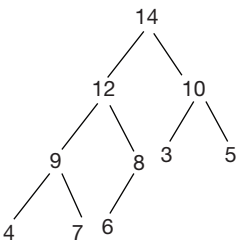
19.

Penny	0
nickel	1
dime	2
quarter	25
half-dollar	26
dollar	27

Choice (B)

21. $\underbrace{(j + 2 * j + 2)}$
Higher precedence   Choice (C)

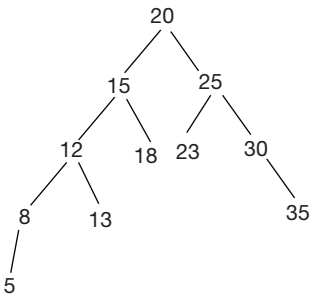**22.** $i\#\#j$ performs macro concatenation
$\therefore$ var1, 2 becomes 'var12', the value of var12 is 30   Choice (B)

24.

Choice (B)

34.

Choice (C)