Sipna College of Engineering and Technology, Amravati

Department of Computer Science & Engineering

Session 2023-24

Year/Sem/Section: 2nd / 3rd /A,B,C

Subject: Data Structures

Question Bank-II

Unit III & IV

Question No.	1-10	11-20
CO- Mapping	CO-3	CO-4

Unit-III

1. Consider the following polynomial equation:
   $P(x, y, z) = 2xy^2 z^3+3x^2yz^2+4xy^3z+5x^2y^2+6y^3z+7x^3z+8xy^2z^5+9$
   i) Rewrite the polynomial so that the terms are lexicographical order.
   ii) Suppose terms are ordered in the parallel arrays COEF, XEXP, YEXP, ZEXP with HEAD nodes first. Assign values to LINK so that the linked list contains the ordered sequence of terms.
2. Explain the following terms : (i) Header linked list (ii) Two Way Linked list
3. Let p(x,y,z) denote the following polynomial :

   $P(x,y,z)=8x^2y^2z - 6yz^8+ 3x^3yz+2xy^7z-5x^2y^3-4xy^7z^3.$

   a) Rewrite the expression in lexicographical order
   b) Suppose terms are stored in the linear arrays COEF, XEXP, YEXP, ZEXP with HEAD nodes first. Assign values to LINK so that the linked list contains the ordered sequence of terms.

4. Let p(x) denote the following polynomial :

   $P(x)=4x^9 + 2x^7 -15x^5+10x^2-2$

   Draw a diagram to represent p(x) by a header list with array structure.

5. What do you mean by linked list ? give and explain the representation of linked list in memory.
6. Write an algorithm for deleting a given node from a linked list with an example.
7. Give the meanings of each of the following terms and show how each of these is handled
   1. Garbage collection
   2. Overflow
   3. Underflow
8. Describe the linked list structure. Illustrate with an example the traversing of linked lists.
9. Discuss the advantages and disadvantages of linked lists over arrays.
10. Describe the algorithm for searching an element in linked list

Unit-IV

11. Consider the infix expression (A + B) * C - D/F. Convert the expression into a postfix expression using algorithmic steps.
12. What is the Priority Queue? Give a different representation of a Priority Queue.
13. Suppose S is the following list of 14 alphabetic characters: D A T A S T R U C T U R E S Suppose the characters in S are to be sorted alphabetically. Use the quick sort algorithm with stack to find the final position of the first character D.
14. Let J and K be the integers and suppose Q(J,K) is recursively defined by

$$Q(J,K) = \begin{cases} 5 & \text{if } J<K \\ Q(J-K, K+2) + J & \text{if } J>=K \end{cases}$$

Find Q(2 ,7), Q(5, 3) and Q(15, 2).

15. Consider the following infix expression. Convert it into its equivalent postfix expression by using inspection and hand method.
    I) Q: ((A+B)↑D) / (E-F)+G
    II) Q: (A-B)*(D/E)
    III) Q: A*(B+D)/E-F*(G+H/K)
16. Let a and b denotes the positive integers and suppose a function Q is recursively defined by

$$Q(a,b) = \begin{cases} 0 & \text{if } a<b \\ Q(a-b, b) + 1 & \text{if } b<=a \end{cases}$$

    i. Find the values of Q(2 ,3) and Q(14, 3).
    ii. What does this function do? Find Q(5861, 7)
17. Suppose A is the following list of 12 numbers. 44, 33, 11, 55, 77, 90, 40, 60, 92, 22, 88, 66 Arrange the list in ascending order by using the Quick Sort algorithm. Show all steps.
18. What is Queue? Write an algorithm for insertion and deletion from array representation of the queue.
19. Translate the following infix expression into its equivalent postfix expression using algorithmic steps. Q: ((A+B)/D)↑((E-F)*G)
20. Suppose STACK is allocated N=6 memory cells and initially STACK is empty i.e.TOP=0. Find the output of the following module.
    1) Set A=2 and B=5
    2) Call PUSH (STACK, A)
       Call PUSH (STACK, 4)
       Call PUSH (STACK, A+B)
       Call PUSH (STACK, B+5)
       Call PUSH (STACK, 9)
    3) Repeat while TOP != 0
           Call POP(STACK, ITEM)
           Write : ITEM
       [End of loop]
    4) Return.