

Name:

Enrolment No:



# UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

## End Semester Examination, May 2019

**Programme Name:** BCA  
**Course Name :** DATA STRUCTURES  
**Course Code :** CSBC1003  
**Nos. of page(s) :** 3  
**Instructions :** All questions are compulsory

**Semester :** II  
**Time :** 03 hrs  
**Max. Marks :** 100

### SECTION A

S. No.		Marks	CO																																																																																																																																				
Q 1	Determine the value of following: $\lfloor 10.5 \rfloor$ , $\lceil -17 \rceil$ , $25 \pmod{8}$ , $-26 \pmod{8} \wedge$ , $\lceil -17.5 \rceil$	4	CO2,3																																																																																																																																				
Q 2	Draw the diagram of the tree  <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>ROOT</th> <th>14</th> <th></th> <th>INFO</th> <th>LEFT</th> <th>RIGHT</th> </tr> </thead> <tbody> <tr> <td>AVAIL</td> <td>8</td> <td></td> <td>1</td> <td>H</td> <td>4</td> <td>11</td> </tr> <tr> <td></td> <td></td> <td></td> <td>2</td> <td>R</td> <td>0</td> <td>0</td> </tr> <tr> <td></td> <td></td> <td></td> <td>3</td> <td></td> <td>17</td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td>4</td> <td>P</td> <td>0</td> <td>0</td> </tr> <tr> <td></td> <td></td> <td></td> <td>5</td> <td>B</td> <td>18</td> <td>7</td> </tr> <tr> <td></td> <td></td> <td></td> <td>6</td> <td></td> <td>3</td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td>7</td> <td>E</td> <td>1</td> <td>0</td> </tr> <tr> <td></td> <td></td> <td></td> <td>8</td> <td></td> <td>6</td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td>9</td> <td>C</td> <td>0</td> <td>10</td> </tr> <tr> <td></td> <td></td> <td></td> <td>10</td> <td>F</td> <td>15</td> <td>16</td> </tr> <tr> <td></td> <td></td> <td></td> <td>11</td> <td>Q</td> <td>0</td> <td>12</td> </tr> <tr> <td></td> <td></td> <td></td> <td>12</td> <td>S</td> <td>0</td> <td>0</td> </tr> <tr> <td></td> <td></td> <td></td> <td>13</td> <td></td> <td>0</td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td>14</td> <td>A</td> <td>5</td> <td>9</td> </tr> <tr> <td></td> <td></td> <td></td> <td>15</td> <td>K</td> <td>2</td> <td>0</td> </tr> <tr> <td></td> <td></td> <td></td> <td>16</td> <td>L</td> <td>0</td> <td>0</td> </tr> <tr> <td></td> <td></td> <td></td> <td>17</td> <td></td> <td>13</td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td>18</td> <td>D</td> <td>0</td> <td>0</td> </tr> </tbody> </table>	ROOT	14		INFO	LEFT	RIGHT	AVAIL	8		1	H	4	11				2	R	0	0				3		17					4	P	0	0				5	B	18	7				6		3					7	E	1	0				8		6					9	C	0	10				10	F	15	16				11	Q	0	12				12	S	0	0				13		0					14	A	5	9				15	K	2	0				16	L	0	0				17		13					18	D	0	0	4	CO2
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Q 3	Design an algorithm to insert a node at end of linked list.	4	CO2																																																																																																																																				

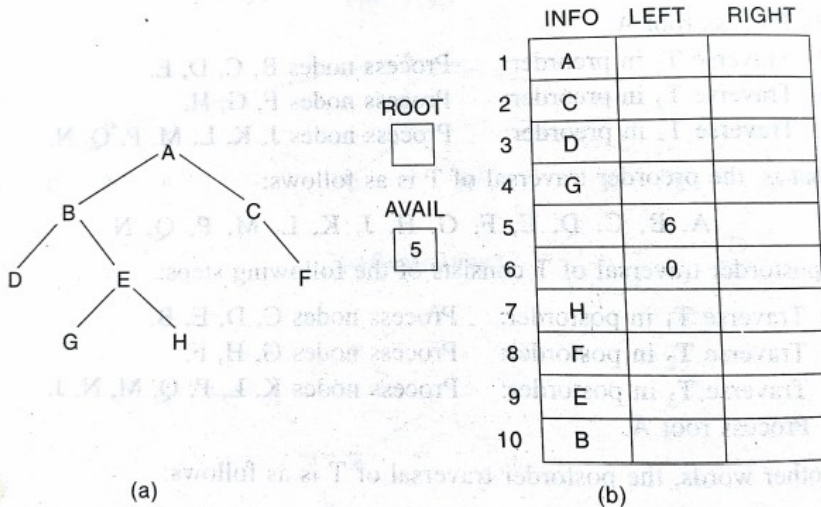
Q 4	<p>.Determine the output of following code: Suppose STACK is allocated N=6 memory cells and initially STACK is empty, i.e. TOP =0. Find the output of the following module:</p> <ol style="list-style-type: none"> <li>1. SET A:=2 and B:=5.</li> <li>2. Call PUSH(STACK,A) Call PUSH(STACK,4) Call PUSH(STACK, B+2) Call PUSH(STACK, 9) Call PUSH(STACK, A+B)</li> <li>3. Repeat while TOP ≠ 0: Call POP(STACK, ITEM) Write: ITEM</li> <li>4. Return</li> </ol>	4	CO2,3
Q 5	Discuss the structure of linked list with help of a diagram	4	CO 2
<b>SECTION B</b>			
Q 6	<p>Consider the following arithmetic expression P, written in postfix notation: P: 12, 7, 3, -, /, 2, 1, 5, +, *, +</p> <p>Using stack, evaluate the postfix expression</p>	10	CO2,5
Q 7	<p>Suppose 8 cards are punched as follows: 345, 142, 350,420,528,27,320,540</p> <p>Given to a card sorter, apply radix sort and show each process followed in each phase. Also find the number of comparisons needed to sort these numbers.</p>	10	CO4
Q 8	<p>Write an algorithm for insertion sort.</p> <p style="text-align: center;">OR</p> <p>Write an algorithm for selection sort</p>	10	CO4
Q 9	<p>Suppose the following sequences list the nodes of a binary tree in preorder and inorder Preoder: G,B,Q,A,C,K,F,P,D,E,R,H Inorder: Q,B,K,C,F,A,G,P,E,D,H,R</p> <p>Draw the diagram of the tree.</p>	10	CO3,5
<b>SECTION-C</b>			
Q 10	<p>What is an AVL search tree? a) Construct an AVL search tree by inserting the following elements in the order of</p>	20	CO1,3

their occurrence 65, 10, 25, 15, 30, 80, 75, 90, 85 ( Perform and clearly show all the rotations involved)

- b) In the above tree constructed, perform the deletion of nodes in the order of their occurrence  
 i) Delete 85  
 ii) Delete 15

**OR**

Consider the tree T in Fig given below.



- a) Fill the value for ROOT, LEFT and RIGHT in Fig (b) so that T will be stored in memory.  
 b) Find (i) depth D of Tree. (ii) the number of null subtrees (iii) the descendants of node B  
 c) List the nodes the tree in a) Preorder b) Postorder

11. Consider the following queues of characters, where QUEUE is a circular array which is allocated six memory cells:

FRONT = 2, REAR=4, QUEUE: \_\_, A, C, D, \_\_, \_\_

(“\_\_” is used to denote an empty memory cell). Describe the queue as the following operations take place:

- (a) F is added to the queue (b) Two letters are deleted (c) K,L and M are added  
 (d) two letters are deleted (e) R is added to the queue (f) Two letters are deleted  
 (g) S is added to the queue (h) two letters are deleted (i) one letter is deleted  
 (j) one letter is deleted

(After each operation, write the value of front, rear and QUEUE)

**20**

**CO1,5**

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### SECTION A

S. No.	Question	Marks	CO
Q 1	Write program/ algorithm for bubble sort.	4	CO2,3
Q 2	Describe header linked list and its types along with suitable diagram	4	CO2
Q 3	Design an algorithm to insert a node at end of linked list.	4	CO2
Q 4	Two operations performed on stacks are push and pop. Write a program to implement STACK using array.	4	CO2,3
Q 5	Describe the structure of queue with help of diagram	4	CO 2

### SECTION B

Q 5	Consider the following arithmetic expression P, written in postfix notation: P: 7,5, 3, +, /, 2, 1 , 4, -, *, -  Using stack, evaluate the postfix expression	10	CO2,5
Q 6	Find the number of comparisons (C), and number of interchange (I) while sorting [8, 22, 7, 9, 5] using bubble sort	10	CO4
Q 7	Write an algorithm for bubble sort.  <div style="text-align: center;">OR</div> Write an algorithm for quick sort	10	CO4
Q 8	Suppose the following sequences list the nodes of a binary tree in preorder and inorder Preoder: G,B,Q,A,C,K,F,P,D,E,R,H  Inorder: Q,B,K,C,F,A,G,P,E,D,H,R  Draw the diagram of the tree.	10	CO3,5

<b>SECTION-C</b>			
Q 9	<p>What is an AVL search tree?</p> <p>a) Construct an AVL search tree by inserting the following elements in the order of their occurrence 65, 10, 25, 15, 30, 80, 75, 90, 85 ( Perform and clearly show all the rotations involved)</p> <p>b) In the above tree constructed, perform the deletion of nodes in the order of their occurrence</p> <p>i) Delete 85</p> <p>ii) Delete 15</p> <p style="text-align: center;"><b>OR</b></p> <p>Write a code to implement following operations on a singly linked list:</p> <p>a) Insertion in the front of linked list</p> <p>b) Insertion at the end of linked list</p> <p>c) Deletion at the beginning of linked list</p> <p>d) Display of all linked nodes</p>	<b>20</b>	<b>CO1,3</b>
10.	<p>Consider the infix expression P: <math>12 / (7+3) + 2 * (1+5)</math></p> <p>(i) Transform P into Postfix Expression using Stacks.</p> <p>(ii) Evaluate the postfix expression achieved as a result of Q10(i) using Stacks.</p>	<b>20</b>	<b>CO1,5</b>