

Xi'an Jiaotong-Liverpool University
西交利物浦大学

PAPER CODE	EXAMINER	DEPARTMENT	TEL
CPT102	S. Guan	Computing	1501

2nd SEMESTER 2021/22 FINAL EXAMINATIONS

BACHELOR DEGREE – Year 2

DATA STRUCTURES AND ALGORITHMS

TIME ALLOWED: 2 Hours

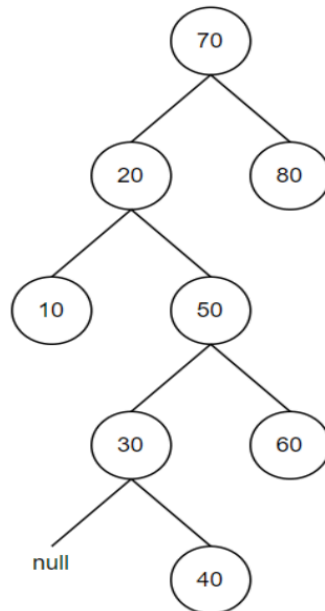
INSTRUCTIONS TO CANDIDATES

- 1、 This is an open-book exam. Please tick the integrity disclaimer *immediately after you initiate the online/onsite exam* and complete the assessment independently and honestly.
- 2、 Total marks available are 100.
- 3、 Answer all questions. There is NO penalty for providing a wrong answer.
- 4、 Only answers in English are accepted.
- 5、 The duration is **2 hours**. Where there are any major problems preventing you from continuing the exam or submitting your answers in time, please do not hesitate to email the Module Examiner () or Assessment Team of Registry ().

THIS PAPER MUST NOT BE REMOVED FROM THE EXAM HALL.

Part II. 25 marks - Answer All Questions

31. A Binary Search Tree (BST) was created by inserting these integers in the following sequence: 70, 20, 50, 80, 30, 10, 40, 60 (i.e. "70" gets inserted first and "60" inserted last).



Drag-and-drop (for online test) or write the correct sequence of integers (for on-site test) when traversing the tree using **Post-order Depth First Traversal**. Note that your sequence must absolutely match the index numbers to the left-most column of the table otherwise 2 marks will be deducted for each incorrect match. The answers for the first 3 indices have been provided. Complete the rest.

(Total 10 marks, i.e. each correct integer sequence worth 2 marks.)

	Correct Integer Sequence	Pick Integers From Here
Index 0	10	10
Index 1	40	20
Index 2	30	30
Index 3		40
Index 4		50
Index 5		60
Index 6		70
Index 7		80

32. Drag-and-drop (for online test) or write the correct sequence number (for on-site test) in implementing the *delete* operation of a *binary min-heap* abstract data type, assuming the element to be deleted is never in the last level. Note that your sequence must absolutely match the step numbers to the left-most column of the table otherwise 3 marks will be deducted for each incorrect match.

(Total 15 marks, i.e. each correct number sequence worth 3 marks.)

	Correct Sequence	Number	Pick Numbers From Here
Step 1		1	Repeat steps 3 to 4 until the node reaches its correct position.
Step 2		2	Find the index for the element to be deleted.
Step 3		3	If the replaced element is smaller than any of its child node, swap the element with its greatest child.
Step 4		4	Take out the last element from the last level of the heap and replace the index with this element.
Step 5		5	Replaced the root element in the heap with the found indexed element.
		6	Output updated binary heap.
		7	If the replaced element is greater than any of its child node, swap the element with its smallest child.
		8	Add the indexed element to the bottom leaf of the heap.

END OF PAPER