Part 1 (20 Minutes)

Instructions

1. Be honest while solving the paper. It would be better to fail the paper than to pass it by unfair means.
2. Share your live location on my WhatsApp (Attach->Location->Share Live Location).
3. The exam will have 4 parts. Solve each part in its given time. Solution of each part has to be submitted in its given time.
4. Solve the paper on clean sheets. On each sheet, write sheet number. On the first sheet, write your roll number and name.
5. Turn on flash light before taking pictures of the solution.
6. Submit the solution through WhatsApp.
7. Do not delete any message, even if you post something irrelevant.
8. You should have a working mic and camera. You may be asked to turn them on.

Q1. {1+4}

a) Write the sum of first two numbers written in front of your name.
b) Write the first instruction three times and all the other instructions one time by hand on your first sheet.

04071713017	Hamza Munawar	44,33,42,7,21,14,28,56,49
04071713035	Haroon Rasheed	21,54,14,56,63,35,42,7,49
04071713040	Faizan Aleem	28,50,42,49,56,63,7,14,21
04071713048	Zahra Abbas	21,54,7,35,28,42,14,21,56
04071713053	Abdul Majeed	7,18,35,42,28,56,49,14,63
04071813027	Syed Ahsan Latif	14,36,56,21,42,28,35,63,7
04071813029	Muqadas Kashaf Ali	56,67,42,63,14,35,21,28,7
04071813033	M. Bhooral	49,38,14,7,28,35,56,63,21
04071813042	M. Aqil Shahzad	21,32,49,35,42,7,28,56,63
04071813043	M. Touqeer Zia	14,36,7,49,21,63,56,42,28
04071913001	Fatima Zahid	32,54,14,28,56,49,35,42,21
04071913002	Sobia Arshad	21,32,7,14,63,49,56,42,28
04071913003	Afifa Nafees	35,68,14,7,28,63,21,42,56

04071913004	Sumaha Shah	21,32,49,7,56,63,35,42,28
04071913005	Aroosha Irfan	49,60,28,21,56,7,35,63,42
04071913006	Abroo Shahid	49,82,14,56,35,63,42,28,21
04071913007	Sana Maryyam	14,36,7,63,56,28,21,35,49
04071913019	M. Nasir Khurshid	49,71,14,63,28,56,42,35,21
04071913023	Hammad Zaheer	35,46,21,49,7,63,14,28,56
04071913024	M. Wahab	14,36,35,63,28,56,7,21,49
04071913025	Abdul Rehman	21,32,42,49,35,56,63,28,7
04071913026	M. Tanzeel Saleem	42,64,49,63,21,14,28,7,35
04071913032	M. Bilal Arif	35,46,63,14,7,49,28,21,42
04071913034	Umair Saleem	35,46,21,63,42,28,14,7,56
09072013001	Moaz Mughal	42,75,56,49,28,14,63,21,7
09072013002	Zaheer Ahmad	56,67,7,63,28,42,21,35,49

Part 2 (40 Minutes)

Q2. How would an empty hash table look like after inserting the first five values given in Q1 in the given order? No code is required for this question. {2+3=5}

a) Using chaining, m = 3
b) Using open addressing, m = 11

Q3. No code is required for this question. {3+3+4=10}

a) How would an empty min-heap look like after inserting the values given in Q1 in the given order?
b) How would the heap in part (a) look like after removing the minimum three values? Clearly show all the steps.
c) Heapify the values given in Q1.

Q4. How would an empty AVL tree look like after inserting the values given in Q1 in the given order? No code is required for this question. {5}

Part 3 (60 Minutes)

Q5. For the AVL tree you have drawn in Q4. {2+3+5=10}

a) Write code to display the value of the predecessor node without using any loop.
b) Write code to insert a new node as a left child of the successor node using a while loop. Assume any valid value for the new node.
c) Write code to traverse the tree in breadth first search (BFS) manner using a while loop, starting from the left child of the root node.

Q6. Consider the hash tables drawn in Q2: {3+4=7}

a) For the hash table drawn in Q2 part (a), write code to display all the values which are stored in the list which contains the first value given in Q1.
b) For the hash table drawn in Q2 part (b), write code to make the hash table empty.

Q7. For the min-heap drawn in Q3 part (a), assume that the values of the heap are stored in an integer array named `data`: {5+3=8}

a) Write a recursive function to count the number of non-leaf nodes.
b) Assume that the min-heap is used in a priority queue. Write client code to display the smallest 3 values in the heap.

Part 4 (20 Minutes)

- Complete any incomplete questions and send them again.
- Do not delete the old solutions!