1. [7 points] The following is the minimum binary heap representing using an array. Add a new element 5 in this minimum heap. Provide all steps.

10	50	30	20	110			
0	1	2	3	4	5	6	7

2. [6 points] Determine if the following array represents a maximum heap. If it does, remove the maximum element from the heap and provide the updated array.

120	50	115	5	30	110		
0	1	2	3	4	5	6	7

3. [7 marks] Below are the tables showing the calculated values for document frequency, inverse document frequency, and term frequency across four documents.

terms	df	idf
hope	2	0.30
love	3	0.12
hate	4	0.00

	d1	d2	d3	d4
hope	20	0	40	0
love	11	12	0	15
hate	11	12	13	14

Rank documents for the query “love hate”.

$$\text{tf-idf}_{t,d} = \text{tf}_{t,d} \times \text{idf}_t. \quad \text{Score}(q,d) = \sum_{t \in q} \text{tf-idf}_{t,d}.$$

1. [8 points] We are creating a binary **min-heap** storing in an array. Insert the following numbers in the order they appear. Write the values of array after inserting each element (you are not required to create tree).
   120, 50, 110, 10, 30, 5

0	1	2	3	4	5	6	7

0	1	2	3	4	5	6	7

0	1	2	3	4	5	6	7

0	1	2	3	4	5	6	7

0	1	2	3	4	5	6	7

0	1	2	3	4	5	6	7

2. [5 marks] Consider the following corpus composed of the following documents.

Doc 1	breakthrough drug for schizophrenia
Doc 2	new schizophrenia drug
Doc 3	new approach for treatment of schizophrenia
Doc 4	new hopes for schizophrenia patients

   Write inverted index entries for the following terms:

   drug: ______________________________

   schizophrenia: ______________________________

3. [7 marks] Create a trie for the following set of words (use * as a terminal character):
   S = {"bit", "byte", "bite", "bits", "bytes", "bites"}