Multiple Choice (1 point each)

Question 1

Heap is a suitable data structure for building priority queues.

- [ ] True
- [ ] False

Question 2

Heap can be built in linear time by repetitive insertion of data into the heap.

- [ ] True
- [ ] False

Question 3

The worst-case time complexity of the naïve pattern matching algorithm is:

$$O(mn)$$

where m is the length of the pattern and n is the length of the text.

- [ ] True
- [ ] False

Question 4

Counting Sort is a comparison-based algorithm.

- [ ] True
- [ ] False

Question 5

In Radix Sort, we focus on digits or keys of the data set.

- [ ] True
- [ ] False

Question 6

In the KMP algorithm, when a mismatch occurs, the pattern itself provides enough information to determine where the next match begins.

- [ ] True
- [ ] False

Question 7

In tries, the number of comparisons required while searching for a word is equal to the length of the word.

- [ ] True
- [ ] False

Question 8 (3 points)

There may be multiple correct answers. Mark all correct combinations.

Suppose:

$$T(n) = aT\left(\frac{n}{b}\right) + f(n)$$

Then:

$$\begin{aligned} &\text{(i)} \quad \Theta\left(n^{\log_b a}\right) \\ &\text{(ii)} \quad \Theta\left(n^{\log_b a} \log n\right) \\ &\text{(iii)} \quad \Theta\left(f(n)\right) \end{aligned}$$

Under the following conditions:

$$\begin{aligned} &\text{(a)} \quad f(n) = \Theta\left(n^{\log_b a}\right) \\ &\text{(b)} \quad f(n) = O\left(n^{\log_b a - \varepsilon}\right),\ \varepsilon > 0 \\ &\text{(c)} \quad f(n) = \Omega\left(n^{\log_b a + \varepsilon}\right) \text{ and } af(n/b) \leq cf(n),\ c < 1 \end{aligned}$$

- [ ] (ii), (a)
- [ ] (ii), (b)
- [ ] (iii), (c)
- [ ] (i), (c)
- [ ] (iii), (a)
- [ ] (i), (b)