TUTORIAL SESSION 6
GRAPH and SORTING

Question 1.

Given a directed graph as illustrated in Figure 1, use the Dijkstra algorithm to find shortest paths from \( d \) to all vertices of the graph. Let \( d(x) \) be the shortest distance currently found from \( d \) to vertex \( x \). Give the values \( d(x) \) for each iteration when applying the algorithms by filling the following Table 1.

![Figure 1.](https://fb.com/tailieudientucntt)

<table>
<thead>
<tr>
<th>processed vertex</th>
<th>( d(a) )</th>
<th>( d(b) )</th>
<th>( d(c) )</th>
<th>( d(d) )</th>
<th>( d(e) )</th>
<th>( d(f) )</th>
<th>( d(g) )</th>
<th>( d(h) )</th>
<th>( d(i) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( d )</td>
<td>( \infty )</td>
<td>3</td>
<td>7</td>
<td>0</td>
<td>5</td>
<td>5</td>
<td>( \infty )</td>
<td>( \infty )</td>
<td>2</td>
</tr>
<tr>
<td>( i )</td>
<td>( \infty )</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>6</td>
<td>2</td>
</tr>
</tbody>
</table>
| \( b \)         | ...      | ...      | ...
| ...             | ...

**Question 2.** Use the Prim’s algorithm to find a spanning minimum tree for the graph given in Figure 2.
Question 3. In which case, the following sorting algorithm is fastest/slowest and what is the complexity in that case? Explain.

a. insertion sort  
b. selection sort  
c. bubble sort  
d. merge sort

Question 4.

For a given “nearly” sorted list, which sorting algorithm (insertion, selection, merge sort) should be used? Why?

Question 5.

Given a list = \{13, 27, 8, 3, 21, 17, 28, 32, 91, 72, 23, 35\}, show the sorting process step-by-step of the following algorithm. What are the number of comparisons and number of moving elements (an exchange 2 elements is considered as 3 moves). Which is the best algorithm in this case?

a. insertion sort  
b. selection sort  
c. heap sort  
d. bubble sort  
e. merge sort  
f. quick sort

Question 6. Repeat question 3 for the following list: \{13, 3, 8, 21, 27, 23, 17, 28, 32, 35, 91, 72\}.

1 The pivot is chosen as described in the slides