Exam on Project Organisation and Management in Software Engineering

Question 1 Process Models (approx. 4 points)

The V-Model 97 and the spiral model are process models for software projects.

1. a) Describe the main characteristics of both process models.
2. b) Give two examples each of projects for which either the V-Model or the spiral model offers advantages.

Question 2 Cost Estimation (approx. 14 points)

You are asked to develop a new web shop for selling and delivering flowers over the internet. For this you need to do an up-front cost estimation. It should be done following the COCOMO2 approach. The main data of the system are:

- **Required master data are:**
  1. customer data (customer number, first name, surname, address, delivery address, email, password)
  2. product data (product number, description, price)
  3. purchase order (product number, customer number, date, quantity, payment method, total price)

- **Required operations are:**
  1. input (no input of customer number) and change of customer data
  2. input (no input of total price) of purchase orders
  3. input of products
  4. querying purchase orders
  5. Printing of purchase orders
  6. Forwarding of the corresponding data (without product data) to the bank for the handling of payments

1. a) Determine each function type and its complexity as well as the total complexity of the system as unadjusted function points. Give short reasons for each number of function types and complexities.
2. b) Which further steps are needed following COCOMO2 for the cost estimation?
3. c) Discuss COCOMO2 in general and as a general approach for estimating arbitrary software projects.
### Question 3  Project Planning (approx. 22 points)

For a development project the following list of activities is given with estimated duration, required number of personal, and preceding activities.

<table>
<thead>
<tr>
<th>activity</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td>duration in weeks</td>
<td>4</td>
<td>3</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>6</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>required number of pers.</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>predecessors</td>
<td>A</td>
<td>A, B</td>
<td>B</td>
<td>C</td>
<td>D, E</td>
<td>G</td>
<td>H</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

An activity can only be started if all its predecessors are finished. The following definitions of milestones are used:

- M1: Activity B is finished.
- M2: Activity F can be started.
- M3: Activity G is finished.
- M4: Activity H is finished.
- M5: Project is finished.

At the beginning of week 1 the project is started.

a) Give a project plan in form of a graph with activities as nodes.

b) Determine the earliest possible date when the project can be finished (pet).

c) Which activities are critical for the date pet.

d) Determine the latest possible date for starting activity C such that the project can be finished at pet.

e) Give a project plan in form of a Gantt-diagram such that
   - at most 3 persons work in parallel in the project and
   - the project can be finished at pet.

f) Is the set of milestones M1 – M5 a reasonable set of milestones for controlling the progress in the project assuming each activity is started at the earliest possible time? Justify your answer by giving all criteria that are fulfilled and those which are not fulfilled.

g) For the project sufficiently many persons are available. Hence each activity is started at the earliest possible time. At the beginning of each week the project status is checked in a meeting. The following table shows at what time which activities delays are recognized for which activities:

<table>
<thead>
<tr>
<th>at the beginning of week</th>
<th>B</th>
<th>C</th>
<th>C</th>
<th>C</th>
<th>F</th>
<th>F</th>
<th>F</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td>delays for this many further weeks</td>
<td>+1</td>
<td>+1</td>
<td>+2</td>
<td>+1</td>
<td>+4</td>
<td>-1</td>
<td>+1</td>
<td>+1</td>
</tr>
</tbody>
</table>

Some delays of activities also cause delays of milestones. Give a diagram showing the development of delays for milestones M1, M2, and M5 ("Meilensteintrendanalyse").