**Question 1**

The manufacturing of a given product is spread across a set of sequential process. The number & order of process differs from product to product.

A spreadsheet has been shared (**ProcessDetails.xlsx**) containing the set of process to be followed to produce a given product.

You are required to write a python script to read data from the shared input sheet & generate a new sheet in the format specifed below.

Example input records:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Product ID | Process 1 | Process 2 | Process 3 | Process 4 |
| PID1.4x12 | CUTTING | HEAT TREATMENT | GRINDING | VISUAL INSPECTION |
| PID1.9x14 | SORTING | HEAT TREATMENT | CUTTING |  |

Points to be noted:

1. In cases where there is a duplication of Product ID, the output should contain that product details only if all the duplicated records have exact same process of manufacturing. In other words, if a Product ID is repeated multiple times with different set of process sequence, it should be excluded from the output.

2. Along with the desired output sheet, provide the list of Product ID excluded from the output along with the reason for the same.

e.g.

* DPH4x10 - repeated 3 times with different process, hence should be excluded from the output.
* DPS4x70 - repeated multiple times but with the same process, hence should be included in the output.
* DPH4x14 - to be excluded from the output as no process is specified.

Example output records:

|  |  |  |
| --- | --- | --- |
| Product ID | Sequence | Process |
| PID1.4x12 | 1 | CUTTING |
| PID1.4x12 | 2 | HEAT TREATMENT |
| PID1.4x12 | 3 | GRINDING |
| PID1.4x12 | 4 | VISUAL INSPECTION |
| PID1.9x14 | 1 | SORTING |
| PID1.9x14 | 2 | HEAT TREATMENT |
| PID1.9x14 | 3 | CUTTING |

**Question 2**

Bill of Materials

BOM or Bill of Material is a document which says how much raw material will be required to make 1 unit of a finished good. For instance, fans are made of motor, blades, wires, screws etc. So BOM for fan will look as following:

* Bom ID: BOM0001
* Finished Good: Fan | 1 Pc
* Raw Materials:
  + Motor | 1 Pc
  + Blades | 3 Pc
  + Screws | 10 Pc

BOM can be single level or multi-level. A multi-level BOM consists for Raw Materials which have further BOM associated with them. For instance, in the above example, Motors are made of Wires and Plates. A multi-level BOM of Fan will look like this:

* Bom ID: BOM0002
* Finished Good: Fan | 1 Pc
* Raw Materials:
  + Motor | 1 Pc
    - Wires | 20 m
    - Plates | 2 Pc
  + Blades | 3 Pc
  + Screws | 10 Pc

In BOM0002, Motor, Blades and Screws are called Level 1 materials and Wires & Plates are Level 2 materials

In the attached excel sheet (**BOM.xlsx**), first sheet or the source sheet contains BOM Details. Column A (Item Name) gives name of the Finished Good (Fan in above example). Column B (Level) gives the level of the Raw Material. '.1' means level 1 Raw Material. '..2' means Level 2 Raw material which is used to make '.1' Raw Material which is just above it, and so on. Column C (Raw Material) contains the name of Raw Materials. Column D and E contain the required quantity and unit of measurement respectively.

**Task**

You will have to write a code in Python / Excel VBA which will do the following:

1. Read the data in Sheet 1
2. Prepare Multiple BOM sheets whose format is given in sheet named 'Fan', 'Motor' etc
3. Each of these new sheets will contain a Single Level BOM each in which Finished good will be single items read from Source sheet.
4. For eg, BOM sheet for Fan will contain Motor, Blades and Screws as Raw materials. BOM sheet for Motor will contain Wires and Plates as raw materials and so on.
5. Source sheet can contain BOM of multiple materials such as Fan and Toy in this example.