1. What are the 3 main *type of notations* used in design documents? Explain why it is important to use different notations to describe software design.

3 main types of notations are:

* Graphical notations
* Program description languages
* Informal text/ natural language

Some notations (e.g., graphical notations) are good for expressing structure, some notations (e.g., formal notations) for describing interface and control in a system and some notations (e.g., natural language) for describing the constraints of each sub-system and etc.

There are different views of a design, which are relevant and which provide different information. These might include a view of sub-systems and their communication (system structuring models), a view of data structure (data structure diagrams), a view of services and constraints of each sub-system (abstract specification), a view of data processing (DFD) etc. It is impractical to include these in a single notation as it would become over-complex.

1. A software engineering project consists of 6 main *design activities*. State and briefly describe the design activities. For each design activity, determine the design notations that are appropriate to be used.

6 main design activities:

* **Architectural Design:** sub-systems & their relationships (communication)

- Graphical

* **Abstract Specification:** Services & constraints of each sub-system

- Informal text

* **Interface Design**: Interfaces with other sub-systems (internal interface) , external interface (devices etc), user interface.

- Graphical + text/Program Design Language (PDL)

* **Component Design:** Services are allocated to different components & design their interfaces

- Graphical + PDL

* **Data Structure Design:** Design data structures used (e.g. link list, records, tables etc)

- Graphical + PDL

* **Algorithm Design:** Design algorithms used to provide the services.

- PDL + text

1. Assuming that you are applying reverse engineering to develop design documents for your company’s legacy systems. Identify and describe 2 types of notations that can be used in documenting user interface design.

2 types of notations:

* **Graphical Notation:** user interface can be designed by using paper based graphical design such as menu, button, URL link can be represented graphically
* **Informal Text:** can be used to further describe the user interface drawn by graphical notation.

1. Differentiate between *cohesion* and *coupling* in system design. Discuss how each of them would affect the maintainability of a system.

**Cohesion** – measure of the closeness of the relationships between its components/measure of the degree to which parts of a program module are closely functionally related

**Coupling** - It is an indication of the strength of interconnections between the components in a design. Highly coupled systems have strong interconnections, with program units dependent on each other while loosely coupled systems are made up of components, which are independent or almost independent. Good design should achieve loose coupling.

1. Compare and contrast between *Coincidental Cohesion* and *Functional Cohesion*. Which one is better in a software design? Justify your answer.

***Coincidental Cohesion*** *–* Parts of a module are grouped arbitrarily –E.g., “Utilities” class

***Functional Cohesion***– Single well-defined task of the module

Functional cohesion is better than coincidental cohesion because each module is designed for a specific task. The degree to which parts of a program module are closely functionally related is the highest in functional cohesion.

1. Around The Globe (ATG) Sdn Bhd is a travelling agency that is owned by family Berth since 1960s. The company is using a high quality legacy system to manage the staff and customers’ information. However, the maintenance cost is increasing recently as a system requires Pascal experts. Seeing that this system has low business value to the company, Berth Junior (CEO of ATG) consults your company regarding the legacy system’s management strategy.

You have found that ATG legacy system design is highly cohesive and loosely coupled. However, the design is hard to understand as it is presented in informal text. What are the 2 other notations that should be used in a system design? Explain with appropriate example for each notation.

2 other notations used in a system design

* **Graphical notation:** overall picture of the system and the relationship between the components. For example: use ERD diagram for database design
* **Program description language:** use control and structuring constructs based on the programming language constructs. Allow the intention of the designer to express but not the details of how the design is to be implemented. For example, SRS in structure format, algorithms design using C programming structure.

1. Standard Printing Company is established in 1981. The main business is designing and printing advertisement. The graphic designer is using a legacy system to design advertisement for customers. The design is stored as both PDF and DOC in the legacy system. The documentation of the legacy system is incomplete and the system is programmed in an obsoleting programming language. Recently, the company is considering purchasing Atlassian JIRA in assisting their advertisement project management. The owner of the company, Mr. S, is consulting you regarding the cost of the tool.

Suggest and explain to Mr.S 2 designs quality metrics that should be included in improving his legacy system.

Design should be highly cohesion and loosely coupled. Cohesion focus on how much the functionality are related to each other within a module, while coupling deals with how much one module is dependent on the other program modules within the whole application.