UNIVERSITY OF MAURITIUS

Faculty of Information, Communication and Digital Technologies

SECOND SEMESTER EXAMINATIONS

MAY 2017

PROGRAMME	**BSc (Hons) Software Engineering**		
MODULE NAME	**Software Engineering Principles**		
DATE	**Monday 15 May 2017**	**MODULE CODE**	**CSE 1039Y(1)**
TIME	**09:30-12:30 Hrs**	**DURATION**	**3 Hrs**
NO. OF QUESTIONS SET	**6**	**NO. OF QUESTIONS TO BE ATTEMPTED**	**6**

INSTRUCTIONS TO CANDIDATES

Answer ALL questions (3 questions from section A and 3 questions from section B).

Use separate answer booklets for section A and section B.

SECTION A

Answer all questions from Section A.

Use separate answer booklet for Section A.

Question 1 (20 marks)

Food Service Supplies (FSS) is a provider of perishable foodstuffs to the catering industry. Orders are received from the customer through paper order forms into the sales department's data processing team. Upon receipt of an order it is recorded and validated before being sent to the Stock Management department. The required products are packaged and the stock being updated accordingly. Since there are many people working in the stock management department, the users should be provided with login and password when updating the stock. When an order has been serviced, the packages are transferred to the Delivery Management dept. The staff schedules the delivery of the products. Finally, the signed Delivery Note (signed by the customer upon receipt of the goods) is returned by the delivery driver to the Accounts Payable team where it is processed and an invoice generated for the customer. The owner would like the project to be signed-off within a six month period from the project start date and using an Agile methodology.

(a) (i) Agile Development is a process that values customer collaboration over contract negotiation. Discuss THREE issues that a Software Engineer should take into consideration when adopting this approach during software development. **[3 marks]**

(ii) Suggest whether agile development would be suitable for the software development project mentioned in the case study. Give justifications for your choice. **[2 marks]**

(iii) With the help of a diagram explain the Agile software methodology. **[5 marks]**

(b) Identify from the case study **three functional** and **three non-functional** requirements. Rewrite the requirements so that they are in line with guidelines for writing good requirements.

[6 marks]

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Question 1 ***(Continued)***

(c) Assume that FSS has a number of branches throughout the country that can handle the deliveries. An analyst has gathered the following requirements for the delivery subsystem.

1. The system must be able to record dispatches to a branch depot. It must make a note of what was dispatched and what time. It should record when it was signed for and highlight any problems with the items delivered.

2. The system must be able to consolidate multiple orders that will delivered by a specific branch.

Comment whether the two requirements listed above abide by guidelines for writing good Requirements. Suggest how it can be improved.

[4 marks]

Question 2 (15 marks)

(a) (i) Explain the following concepts of cloud computing, and give examples how each can be used to deploy cloud services.

1. Software as a Service.
2. Platform as a Service.
3. Infrastructure as a Service.

[3 marks]

(ii) Which Architectural model will you propose for the following system.

- A foreign language translator to be used during international conference. It will capture a voice recording of the talk, then translate it to a number of different languages depending on the listener preferences.

- A vehicle detection system that will use camera placed at the gates of the university campus to grant access to vehicles through an automated gate.

[2 marks]

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Question 2 (Continued)

(b) (i) Briefly explain the term cohesion and coupling when designing software. **[1 mark]**

(ii) Consider the code for the following method:

```
class Calculator
{    private int addres,subres, mulres;
     public void operation(int a, int b)
     {   addres = a + b;
         subres = a - b;
         mulres = a * b;
         system.out.println(addres, subres, mulres);
      }
}
```

According to you, what type of cohesion does the above method exhibit? Support your answer with appropriate justifications. **[2 marks]**

(c) Draw the activity network diagram for the software project as per task dependency table listed below. **Identify the critical path and show your calculations.**

Task	Duration(days)	Dependencies
T1	10	-
T2	5	-
T3	6	T2
T4	5	T1,T2
T5	4	T3
T6	7	T4
T7	6	T5,T6
T8	10	T7

[4 marks]

(d) (i) Function Points are general, high level system size metrics. Which aspects of the software system are taken into account when using Function Point technique. **[1 mark]**

(ii) Some estimating methods use input variables or parameters which are called drivers. Describe TWO drivers that could be used in a parametric approach.

[2 marks]

Question 3 (15 marks)

(a) With the help of a diagram, briefly explain the five stages of a Capability Maturity Model (CMM).

[2 + 3 marks]

(b) Differentiate between the following:

(i) Mean time to failure (MTTF) and Mean time to Repair (MTTR)
(ii) Software verification and software validation
(iii) Perfective and Corrective maintenance

[3 marks]

(c) For the given piece of code listed below, draw the control flow graph and calculate the cyclomatic complexity.

```
1    i=0;
2    n=4
3    while (i<n-1) {
4      j=j+1;
5      while (j<n) {
6         if A[i] < A[j] {
7            swap(A[i], A[j]);
8        }
       }
9    i=i+1;
10   }
```

[5 marks]

(d) A new system is specified and needs to be implemented. The designer has proposed that some components of the old system can be reused. Give ONE advantage and ONE disadvantage of reusing old components when implementing the new system.

[2 marks]

SECTION B

Answer all questions from Section B.

Use separate answer booklet for Section B.

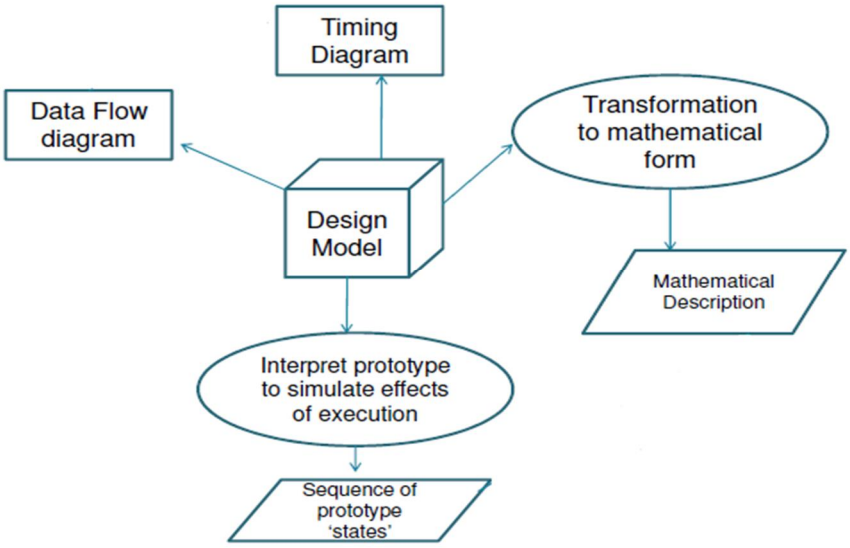
Question 4 (20 marks)

(a) You have been approached to design an information system for a company. By considering two stakeholders in a new small computing system, describe how you will design the solution by using **views** and **viewpoint**. **[4 marks]**

(b) Briefly elaborate on the different characteristics that an exceptional designer should possess? **[3 marks]**

(c) Using suitable diagram, explain the **4+1 View Model**. **[5 marks]**

(d) From the diagram below, identify a **direct viewpoint** and a **derived viewpoint**. Distinguish between them.



[2+2 marks]

(e) Software engineering view is concerned with the development of new software systems which is both expensive and time-consuming. Describe the major concerns for those stakeholders who are going to develop the system.

[4 marks]

Question 5 (15 marks)

(a) A software development company wishes to adopt the Dynamic Systems Development Method (DSDM) for the design of a new system. Explain FIVE principles of the DSDM framework. **[5 marks]**

(b) You are a software designer at Smith Alarmtech Ltd and the project manager communicates to you an important message:
"Our competitor Red AlarmPlus Ltd has a new system that detects motion and sound alarm instantly. They also have option for generating silent alarms. Their sales are growing and our customers demand same. How quickly can you deliver me a new alarm system with these features?"

Which design methods would you apply for developing such a system? Justify your answer. **[2 marks]**

(c) Explain the principles of **stepwise refinement** in software development. **[2 marks]**

(d) A hotel is planning to automate its room booking system. When a guest arrives to the hotel, the receptionist would be able to see which rooms are free in order to allocate one to the guest. When the guest leaves, the room would be marked as free again. Each day the cleaners would be given a list of the rooms that are in use. At any time the receptionist would be able to use the room number to find the name and home address of a guest, or could search the room system for a named guest.

(i) Draw a top-down design diagram to show how the room booking system could be developed. **[3 marks]**

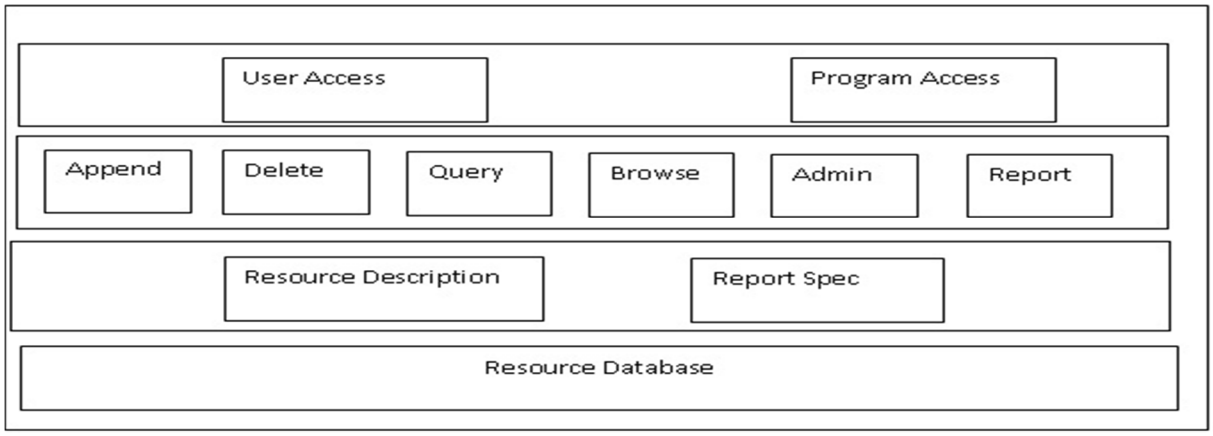
(ii) By making reference to the design made in (i) discuss how effective modular design can be achieved through functional independence of the individual components. **[3 marks]**

Question 6 (15 marks)

(a) Construct a first level architecture for an automated ticket issuing system that will be used by passengers at the Metro Express railway stations. Passengers will select appropriate destination and system will display ticket price. User will be prompted for inputting no. of tickets, type of ticket (adult or child), type of journey (single, return) and system will issue appropriate tickets after processing payment. **[6 marks]**

(b) Explain why design patterns are effective form of design reuse. **[3 marks]**

(c) The following architectural design illustrates a generic resource management system for managing inventory with generic facilities such as the facility to add a resource to the inventory, the ability to withdraw a resource, the ability to present queries and the ability to generate reports.



By making use of the principles of design patterns, use the above to design the architecture of a library system which will provide similar facilities present in the generic inventory system above together with new additional facilities for **issuing** and **returning resources** (books). **[2 marks]**

(d) Give TWO limitations of using design patterns. **[4 marks]**

END OF QUESTION PAPER