Faculty of Science

Academy of Computer Science and Software Engineering

Final Summative Assessment
Third Opportunity

Module	**IFM03A3 / IFM3A10** Informatics 3A – Introduction to Software Engineering
Campus	APK
Month	August 2020

Date	4 August 2020	**Reading Time** download and read assessment paper	10 minutes (15:00)
Assessor	Dr F F Blauw	**Writing Time**	180 minutes (15:10)
Moderator	Prof A J van der Merwe (UP)	**Submission Time** export diagrams, compile & save document, and upload	50 minutes (18:10)
Marks	150	**Submission Closes**	19:00

Instructions

- Answers may be typed, or hand-written and photographed.
- Ensure that all diagrams are neatly drawn, either by hand or using a drawing tool.
- Unless otherwise stated, diagrams do not constitute complete answers.
- Where possible, provide answers in the form of a list.
- Where possible, upload your submission as a single **PDF document**.
- Please **DO NOT** compress (ZIP, RAR, etc.) your submission.
- Please upload your submission before the closing time at **19:00**

THIS QUESTION PAPER CONSISTS OF 5 PAGES

ExtermyGogga

No escape from the fate that you make

Mr Cad Louse enters, looking as mousy as ever, his chihuahua following close in tow.

"Thank you!" Mr Louse squeaks, "You have done an excellent job with our Bug Bibliography. But the time has come to get rid of them! I have started my own extermination business and I need your help!"

"I personally manage our exterminators. We keep strict record of exactly when each of our exterminators are hired and how many critters they have cancelled. Each exterminator has a speciality. Some deal with flying insects while others deal with insects that like to borrow and scamper.

"The insecticide manager – Ms Venin – needs to know exactly what and how many cans of insecticide are currently in storage and how many are currently being used. Depending on how many assignments we get per week, she adjusts her order accordingly.

"Then there is the swatter manager – Mr Clobber – and he must know exactly which swatter is being used. Swatters need to be serviced regularly, otherwise they will fall apart and so will Mr Clobber. Each swat needs to be registered when returning from assignment and a service booked when the swatter has slapped 100 times.

"Exterminators are assigned based on their speciality. When an exterminator goes on assignment, I must know which exterminator is currently on assignment. I also need to know the status of their assignment, as provided by the exterminator. We cannot have too many idle exterminators!

"An exterminator returning from assignment, must log a report, but they also need to return all insecticide cans (full or empty) and swatters to their respective departments. Finally, during the reporting, the exterminator needs to log the bugs that were slain, if any. A record is kept, according to the Bug Bibliography.

"I want to see exactly which bugs can be found in which areas around our service area. If I see an increase, we might need to hire more exterminators."

"Do you think you can help out, lad?"

Mr Louse squeaks as he leaves. You start questioning your own sanity.

QUESTION 1

1.1. Provide a definition for Software Engineering. (3)

1.2. But, what is software? (3)

1.3. Building software faces new challenges every day. Briefly describe one such a challenge and the best way you believe to overcome this challenge. (4)

[10]

QUESTION 2

One of the most difficult tasks software engineer faces, is understanding the requirements. The seven tasks of requirements engineering can be defined as follows:

1. Inception
2. Elicitation
3. Elaboration
4. Negotiation
5. Specification
6. Validation
7. Management

2.1. Which **requirements analysis model** would be the best for the project described by Mr Louse? Motivate your answer by referring to the steps described above. (7)

2.2. Provide a concise **problem statement** for the ExtermyGogga. (4)

2.3. Provide a brief **proposed solution** for the ExtermyGogga. (4)

[15]

QUESTION 3

3.1. Name one **non-functional requirement** that specifically applies to the ExtermyGogga. Explain how you believe it can be applied and how it can then be measured. *NOTE: Do not use general non-functional requirements such as: security, reliability, availability, etc.* (5)

3.2. List *all* the **functional requirements** that you can extract from Mr Louse's description of ExtermyGogga. ***NOTE: The mark allocation does not indicate the number of functional requirements.*** (6)

3.3. Draw a **use case diagram** illustrating the use cases derived from the requirements identified in **Question 3.2**. (20)

3.4. If you could **alter** the functional requirements for ExtermyGogga, what would you add or change, and why? (4)

[35]

QUESTION 4

Draw an **activity diagram** for a use case entitled: "*Complete Assignment*".

[15]

QUESTION 5

Consider the following C# code. Draw an **Interaction Sequence Diagram** to model the code. You may assume that **`Main`** is automatically executed.

```
01:  class Program
02:  {
03:     static void Main()
04:     {
05:        bool ground = // value from GUI
06:        Exterminator me = new Exterminator();
07:        Assignment myAssignment = new Assignment(me);
08:        myAssignment.GetTransport(ground);
09:        myAssignment.Execute();
10:     }
11:  }
12:
13:  class Assignment
14:  {
15:     private Exterminator _mainExterminator;
16:     private Vehicle missionTransport;
17:     public Assignment (Exterminator mainExterminator)
18:     {
19:        _mainExterminator = mainExterminator;
20:     }
21:
22:     public void GetTransport(bool groundMission)
23:     {
24:        missionTransport = new Vehicle(groundMission);
25:     }
26:
27:     public void Execute() {
28:        mainExterminator.Dispatch(missionTransport);
29:     }
30:  }
31:
32:  class Exterminator
33:  {
34:     public void Dispatch(Vehicle myTransport) {
35:        // Off on an assignment
36:        myTransport.Go();
37:     }
38:  }
39:
40:  class Vehicle
41:  {
42:     private bool _needsDigger;
43:     public Vehicle(bool groundMission) {
44:        _needsDigger = groundMission;
45:     }
46:     public void Go() {
47:        if (_needsDigger)
48:            System.Console.WriteLine("Dig dig dig.");
49:        else
50:            System.Console.WriteLine("Swat swat swat.");
51:     }
52:  }
```

[20]

QUESTION 6

6.1. Which **software development process** do you think will be best for the development of ExtermyGogga? Motivate your decision based on ExtermyGogga. (3)

6.2. Provide a brief description of the **operation** of the software development process you selected in Question 6.1. You may use a diagram to aid you. (7)

[10]

QUESTION 7

7.1. What is a **software architecture**? (3)

7.2. Why is it important to decide on a software archicture for a particular project? (3)

7.3. When starting an architectural design, you are faced with many possible architectural styles. What are the two factors you need to consider when choosing an appropriate style? Briefly describe each. (2)

7.4. Considering ExtermyGogga, which **generic architectural style** will you base your design on? Motivate your decision. (2)

7.5. Use a diagram to describe the architectural style you selected in **Question 7.4** while referring to ExtermyGogga in the diagram. (10)

[20]

QUESTION 8

8.1. Choose any one (1) **design pattern** *(creational, structural, or behavioural)* that could be applied to ExtermyGogga. Motivate why you chose this pattern, then briefly describe it. (5)

8.2. Draw a conceptual class diagram for ExtermyGogga demonstrating the design pattern that you chose in **Question 8.1**. (10)

[20]

QUESTION 9

Considering that ExtermyGogga deals with highly sensitive data, discuss measures you will put in place to secure this data from unauthorised access.

[5]

» End of Exam «