UNIVERSITY OF JOHANNESBURG

FACULTY OF SCIENCE

ACADEMY OF COMPUTER SCIENCE & SOFTWARE ENGINEERING

MODULE	**IFM3B10** ADVANCED SOFTWARE ENGINEERING
CAMPUS	APK
EXAM	NOVEMBER 2014

DATE	10 NOVEMBER 2014	**SESSION**	08H30 – 11H30
DURATION	3 HOURS	**MARKS**	150
ASSESSOR		MR T.D. MPHUTHI	
INTERNAL MODERATOR		DR W.S. LEUNG	
EXTERNAL MODERATOR		DR L. FUTCHER	

PLEASE TAKE CAREFUL NOTE OF THE FOLLOWING:

1. All questions are compulsory.
2. Answer all questions that refer to the CASE STUDY, in relation to the CASE STUDY provided.
3. Answer all questions that do not refer to the CASE STUDY, in relation to the material covered during the course of the module.
4. Answer all questions in the ANSWER BOOK(S) supplied.
5. Note the mark allocation for each question: if a question is worth 2 marks, give at least two points' worth of answers.
6. Do NOT write in pencil. **Anything in pencil <u>WILL NOT BE MARKED</u>**.
7. Write neatly and legibly. We cannot mark what we cannot read.
8. **NO** calculators may be used.
9. This question paper consists of 6 (including this cover page) pages.

Question 1 – Software Testing [14]

1.1 Briefly **describe** what **the two** concepts of **verification** and **validation** mean in terms of software engineering. (2)

1.2 **Is** the **approach** to **verification** and **validation** that is employed by the developers of the Zero-Poaching system (in the CASE STUDY) **sufficient** for a system as large and critical as Zero-Poaching? Provide two facts to support your answer. (3)

1.3 During development testing, testing may be carried out at three levels of granularity. Briefly **name** and **describe** each of these **three levels** of **granularity** in **development testing**. (6)

1.4 Briefly **describe** how you would **advise** the developers of the Zero-Poaching system (in the CASE STUDY) such that they achieve their desired **software testing goals**. (3)

Question 2 – Security Engineering [14]

2.1 **Name three system layers** where **security** may be **compromised**. (3)

2.2 **Identify two vulnerabilities** that may arise from the **architectural design decision** made for the Zero-Poaching system (in the CASE STUDY). (2)

2.3 **List the three system protection layers** that may be put in place in an attempt to **counter attacks** on a system. (3)

2.4 **Propose three survivability strategies** for dealing with the potential **attack** on ghsr-shop.com as described by the website's Chief Administrator (in the CASE STUDY). Include **one approach** for achieving each strategy proposed. (6)

Question 3 – Dependability and Security Assurance [10]

3.1 What are **the three static analysis techniques** that may be used on **critical systems**, in addition to inspections and reviews? (3)

3.2 Briefly **describe** how you would **measure** the **reliability** of a **system**. You may use a diagram to aid your description. (5)

3.3 What is **the difference** between **statistical** testing and **defect** testing? (2)

Question 4 – Software Evolution [14]

4.1 Use a **diagram** to illustrate how the Zero-Poaching system (in the CASE STUDY) will **evolve** throughout its lifetime. (5)

4.2 **How** would you refactor **duplicate code**? (1)

4.3 **What are the four basic issues** that have to be **discussed** with system **stakeholders** when **assessing** the **business value** of a system? (4)

4.4 a. Under which of the four **clusters** of **legacy systems** would you **categorise** the legacy system used by the Green House Safari Resort (in the CASE STUDY)? Provide a reason for your answer. (2)

b. What **two strategic actions** should the Green House Safari Resort's management take regarding the **legacy system** (in the CASE STUDY)? (2)

Question 5 – Project Management [14]

5.1 What are the **three main differences** between **software** engineering and **other** forms of engineering? (3)

5.2 Briefly **describe** the **risk management process**. (4)

5.3 a. What **motivates** an **interaction-oriented** person? (1)

b. What **factors** need to be **addressed** in order to resolve the **poor team**work within the software development team (discussed in the CASE STUDY). (3)

5.4 Provide **three types** of **risks** that can be identified in the CASE STUDY. (3)

Question 6 – Project Planning [14]

6.1 What are **the three stages** in a **project's life cycle** where project **planning** takes place? (3)

6.2 Use a **diagram** to **illustrate** an **activity bar chart** for the Zero-Poaching system's development project (as described in the CASE STUDY), based on the high-level project time-line presented in Table 1. Make sure to take note of the **duration**, **dependencies** and end **deliverables** of each task. (5)

6.3 Use **basic algorithmic cost modelling** to determine if the R800 000 amount put aside by the Green House Safari Resort's management (described in the CASE STUDY) will be sufficient for the project. Use the cost modelling variables identified in Table 2 as the basis for your cost estimation. (4)

6.4 **Name two** of the four **sub-models** of the **COCOMO** II model. (2)

Question 7 – Quality Management [14]

7.1 Briefly **discuss** the **principal concerns** of software **quality management** at the project levels. (2)

7.2 What are **the two review activities** that the **Pre-Review phases** of the software review process is typically concerned with? (2)

7.3 Briefly **describe three internal attributes** of the Zero-Poaching system that you can use to measure the most important external quality attribute to the Green House Safari Resort's management (discussed in the CASE STUDY)? Include a description of what each measurement will imply for the external quality attribute. (6)

7.4 Briefly **describe** the **Fan-in/Fan-out** static software product metric, as well as what a high value means for this metric. (4)

Question 8 – Configuration Management [12]

8.1 Briefly **name** and **describe the four** closely related **configuration management activities**. (8)

8.2 **Name two features** provided by **version management systems**. (2)

8.3 Briefly **distinguish** between the use of **timestamps** and **checksums** as signatures for keeping track of source code versions. (2)

Question 9 – Process Improvement [14]

9.1 **Name** and **describe the three** main **stages** of process improvement. (6)

9.2 What are **the three types** of **process metrics** that can be collected when measuring processes? (3)

9.3 Which **CMMI level** of maturity would you assign to the Green House Safari Resort (in the CASE STUDY)? Provide two reasons to support your answer. (3)

9.4 a. **How** does the **continuous CMMI** model **differ** from the **staged CMMI** model? (1)

b. What **advantage** does the **continuous CMMI** model have **over** the **staged CMMI** model? (1)

Question 10 – Component-based Software Engineering [10]

10.1 **Name three essential elements** of Component-based Software Engineering other than development processes. (3)

10.2 Use the **UML** notation to **draw** a **diagram illustrating** the two related **interfaces** of a component. Ensure that your diagram also includes a **description** of the interfaces. (5)

10.3 Which **component composition** would be the most appropriate to use when integrating the Zero-Poaching system with the existing ghsr-shop.com website (described in the CASE STUDY)? Provide a reason for you answer. (2)

Question 11 – Service-Oriented Architecture [8]

11.1 a. What does the **acronym WSDL** stand for in terms of Service-Oriented Architectures? (1)

b. What is the **purpose** of **WSDL** in terms of Service-Oriented Architectures? (1)

11.2 Briefly **name** and **describe the three logical stages** in the service engineering process. (6)

Question 12 – Legal and Ethical Aspects of IT [12]

12.1 a. Briefly **describe** a **legal person**. (2)

b. **How long** would a **copyright** owned by a **legal person** remain in **effect** for? (1)

12.2 Provide **two examples** of what would be considered **unethical conduct** from an **IT Professional**. (2)

12.3 Briefly **describe direct infringement**. (2)

12.4 Provide **three approaches** that you would use for dealing with **spam**. (3)

12.5 IT professionals can be held morally and legally liable for their actions. Identify and discuss one type of **ethical responsibility** that is **expected** of **IT professionals**. (2)