



**ZIMBABWE EZEKIEL GUTI UNIVERSITY**

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**FACULTY OF HEALTH, SCIENCE AND TECHNOLOGY**

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**DEPARTMENT OF DIGITAL TECHNOLOGY**

**EXAMINATION PAPER**

**COURSE CODE** : MIS107  
**COURSE TITLE** : Software Engineering  
**SPECIAL REQUIREMENTS** : None  
**DURATION** : 3 Hours  
**LEVEL** : 2.1  
**DATE** : February 2022

15 FEB 2022

**INSTRUCTIONS TO CANDIDATES:**

1. Answer **ALL** Questions in Section A.
2. Answer any **THREE** Questions from Section B.
3. The marks allocation for each question are indicated in **BOLD** font.

## Section A [40 marks]

Answer ALL the questions from this section.

### Question 1

Zimbabwe Ezekiel Guti University (ZEGU) library is currently having problems in tracking books borrowed by students and staff members. They are using a paper based system.

The new system that is being proposed is as follows. To join the library the member could be a student or a staff member. If a member joins as a student they are required to provide their student ID card upon registration and if the member of staff joins the library, they also need to produce their staff ID. The librarian will capture the details into the system. The system will allow the librarian to add the member into the system. If the member joins the library as a staff member they are allowed to borrow a maximum of 10 books and if the member is a student they can borrow a maximum of 5 books each time they borrow books from the library. The system will allow a librarian to add a new book into the system each time the university purchase new books. Each time a member borrows a book from the library the librarian checks out the book from the library and when the member returns the book the librarian checks in the book into the library system. Staff members each time they borrow a book the loan period is for three months but for students the loan period is for 1 month. The members can use the system to reserve a book which they want from the library and they can also extend the loan with a further 1 month.

- i) Identify the business processes and rules for the new system. [4 marks]
- ii) Who are the stakeholders of the new system? [4 marks]
- iii) Come up with five functional requirements for the new system. [10 marks]
- iv) Invent two non functional requirements together with their fit criteria. [4 marks]
- v) Come up with a use case diagram for the new library system proposed above. [10 marks]

Read the following passage and answer the question that follows

- vi) When a member wants to borrow a book they can come and see the librarian in the library. The member will indicate the book(s) they want and the librarian will check the book(s) if they are available in the system. If the books are on loan the

member is told and the process ends, however if the books are available, the librarian will check the member type so that she can process the duration of the book(s) loan. The librarian will also check if the member has not exceeded the book limit using the system, if they have exceeded they are told and if they do not have the borrowing powers the member is told and the process ends. However if they have borrowing powers the member will check the books to leave in the library and the ones they want to borrow. The librarian will proceed and check out the books from the library and the system generates the loan number and the member is issued with the number and the process ends.

Come up with an activity diagram to represent the borrowing process above, you are supposed to come up with two swimlanes, one for the member and the other for the librarian. **[8 marks]**

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### Section B [60 marks]

Answer any **THREE** questions from this section.

#### Question 2

- i) Identify the shortcomings of the waterfall model. **[6 marks]**
- ii) Explain the following terms and also explain the testing techniques that are used for each term  
Verification  
Validation **[6 marks]**
- iii) Explain the difference between the spiral and the incremental model. **[8 marks]**

#### Question 3

ZEGU library lends books to members of the library. A member can borrow a maximum of 5 books per each loan. James borrowed three books from the library and Martha borrowed 2 books from the library.

i) Using the above scenario, show the difference between a class diagram and an object diagram. You need to draw the class and the object diagrams to show the difference and show the multiplicities and objects where possible. [10 marks]

ii) Explain the nature of software requirements. [10 marks]

#### Question 4

Mitchell who is a member of the ZEGU library borrows a book from the library. The system needs to check if the book is available, if the book is available, the book is set to Mitchell's loan account and the book is no longer available in the library's records for the duration of the book loan.

i) Show the above scenario using a sequence diagram, shows the messages that are passed between the various objects in the sequence diagram. [10 marks]

ii) Explain the advantages and disadvantages of using a standard modelling language such as UML in software engineering. [10 marks]

#### Question 5

i) What is meant by the term Cyclomatic complexity metric?. [4 marks]

ii) Study the below code

```
1. public String response (String text) {
2.   if (text.endsWith("?"))
3.     return "This Exam is easy..";
4.   Vector words = new Vector();
5.   StringTokenizer breaker = new StringTokenizer(text.toLowerCase(), ".,?!");
6.   While (breaker.hasMoreElements())
7.     Words.addElement(breaker.nextElement());
8.   If (words.size() > 1 &&
9.     Words.elementAt(0).equals("i") &&
10.    words.elementAt(1).equals("feel"))
11.    return "So you feel " + words.elementAt(2);
```

```
12. for (int i=0; i<words.size(); i++) {  
13. String relative = (String) words.elementAt(i) ;  
14. if (isRelative (relative))  
15. return "Tell me how the Exam is treating you" + relative;  
16. }  
17. return "Tell me more..";  
18. ;
```

Calculate the Cyclomatic complexity metric of the above code. Note: Indicate the line number and the Cyclomatic complexity. **[16 marks]**