MURANG'A UNIVERSITY OF TECHNOLOGY

SCHOOL OF COMPUTING AND INFORMATION TECHNOLOGY

DEPARTMENT OF INFORMATION TECHNOLOGY

UNIVERSITY POSTGRADUATE EXAMINATION

2018/2019 ACADEMIC YEAR

FIRST YEAR **FIRST** SEMESTER EXAMINATION FOR MASTER OF SCIENCE IN INFORMATION TECHNOLOGY

SCS 602 – RESEARCH METHODS IN COMPUTING

DURATION: 3 HOURS

DATE: 6/5/2019

TIME: 9-12 P.M.

Instructions to candidates:

1. Answer **Any Four** questions.
2. Mobile phones are not allowed in the examination room.
3. You are not allowed to write on this examination question paper.

QUESTION ONE (25 MARKS)

Carefully study the journal paper abstract provided below and then answer the questions that follow.

ABSTRACT

Many authors have implied dependency cycles are widespread among the classes of object-oriented software systems. Proponents of the design principle "Avoid cyclic dependencies among modules" have argued such cycles are detrimental to certain software quality attributes (e.g. understandability, testability, reusability, buildability and maintainability). In this paper present the first significant empirical study of cycles among the classes of 78 open and closed source Java applications. We find that, of the applications comprising enough classes to support such a cycle, around 45% have a cycle involving at least a 100 classes and around 10% have a cycle involving at least 1000 classes. We present further empirical evidence to support the contention these cycles are not due to intrinsic interdependencies between particular classes in a domain. Finally, we attempt to gauge the refactoring burden to break all these cycles using the concept of a minimum edge feedback set.

i. What is the problem being studied? (6 marks)

ii. What is the purpose of the study? (3 marks)

iii. Describe and interpret the results obtained from the study. (10 marks)

iv. In your opinion, what are the possible future works that can come out of this researcher? (6 marks)

QUESTION TWO (25 MARKS)

You have been given a topic called "A reliable routing method for mobile Ad hoc networks." Use this topic to answer the following questions.

i. Write a problem statement corresponding to the topic. (10 marks)

ii. Describe an experiment that you think could be used to validate this method. (10 marks)

iii. Explain the statistics that you are likely to use in the experiment in (b) above. (5 marks)

QUESTION THREE (25 MARKS)

a) Explain the differences between the following scales of measurement based on their characteristics. (8 marks)
   i. Nominal and ordinal
   ii. Interval and ratio

b) It has been argued that the human mind is a powerful tool of research. Do you agree with this argument? Explain. (10 marks)

c) It has been said that research is a cyclical process. Explain how this is so and support your explanation with a suitable example. (7 marks)

QUESTION FOUR (25 MARKS)

a) It has been argued that a good research project should not be a use for achieving self-enlightenment. Do you agree with this argument? Explain. (8 marks)

b) Distinguish between basic and applied research. Give examples of research topics that you think would be suitable under each category. (8 marks)

c) Do you think it would be beneficial to combine basic and applied research? Explain with an example topic that combines both. (9 marks)

QUESTION FIVE (25 MARKS)

Study the attached paper entitled "Developing a complexity metric for inner classes" and then answer the following questions.

i. What are the objectives of the study? (4 marks)

ii. With suitable examples, explain why we need inner classes in Java and why this design approach can lead to increased and undesirable software complexity. (6 marks)

iii. Explain how the proposed metric works and then use it to calculate the complexity of the Java program below. (8 marks)

```
Class A
    {
        Class B {
                Class B1 {
                    Class B2 {
                        Class B3 {
                        }
                    }
                }
            }
        Class C {
                Class C1 {
                    Class C2 {
                        }
                    }
                }
            Class D {
            }
}
```

iv. Describe a suitable empirical study that you would use to validate the metric proposed in this paper. (7 marks)