



MURANG'A UNIVERSITY OF TECHNOLOGY

SCHOOL OF COMPUTING AND INFORMATION TECHNOLOGY

DEPARTMENT OF INFORMATION TECHNOLOGY

UNIVERSITY ORDINARY 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: 17/12/2018

TIME: 9:00 - 11:00AM

Instructions to candidates:

1. Answer question One and Any Other Two 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)

The abstract given below was extracted from a recently published journal paper. Study the abstract carefully and then answer the questions that follow.

ABSTRACT

A code smell indicates a poor implementation choice that often worsens software quality. Thus, code smell detection is an elementary technique to identify refactoring opportunities in software systems. Unfortunately there is limited knowledge on how similar two or more developers detect smells in code. In particular, few studies have investigated if developers agree or disagree when recognizing a smell and which factors can influence on such (dis)agreement. We perform a broader study to investigate how similar the developers detect code smells. We also analyze whether certain factors related to the developers' profiles concerning background and experience may influence such (dis)agreement. Moreover, we analyze if the heuristics adopted by developers on detecting code smells may influence on their (dis)agreement. We conducted an empirical study with 75 developers who evaluated instances of 15 different code smell types. For each smell type, we analyzed the agreement among the developers and we assessed the influence of 6 different factors on the developers' evaluations. Altogether more than 2700 evaluations were collected, resulting in substantial quantitative analyses. The results indicate that the developers presented a low agreement on detecting all 15 smell types analyzed in our study. The results also suggest that factors related to background and experience did not have a consistent influence on the agreement among the developers. On the other hand, the results show that the agreement was consistently influenced by specific heuristics employed by developers. Our findings reveal that the developers detect code smells in significantly different ways. As a consequence, these findings introduce some questions concerning the results of previous studies that did not consider the different perceptions of developers on detecting code smells.

Moreover, our findings shed light towards improving state-of-the-art techniques for accurate, customized detection of code smells.

- (a) What is the problem being studied? (4 marks)
- (b) State the main objective of the paper? (4 marks)

- (c) Describe the methodology used to solve the problem. (6 marks)
- (d) Comment on whether the conclusions arrived at are acceptable and justify your answer. (6 marks)
- (e) Generate a research topic for the provided abstract and then relate the new topic to the research described in the abstract. (5 marks)

QUESTION TWO (25 MARKS)

One of your lecturers has asked you to write an assignment about the “Factors affecting Software quality”. This will require you to spend a considerable amount of time in the library. Upon completing your assignment, your lecturer gave you a second assignment with the following questions.

- a) Would you consider the library reading activity that enabled you to tackle the first assignment as research? Explain. (6 marks)
- b) It has been said that research is a cyclical process. Explain how this is so. (6 marks)
- c) Supposing that you are curious to find whether programmer attitudes could be one of the factors likely to affect software quality, show how you would employ the scientific method to solve the problem. (8 marks)
- d) Which between qualitative research and quantitative research approach would be the most suited to solve the problem in (c) above. Justify your answer. (5 marks)

QUESTION THREE (25 MARKS)

Given the research topic “An efficient web search method” answers the following questions.

- a) Give a possible motivation for undertaking this research. (4 marks)
- b) Give at least 3 research hypotheses and their corresponding null hypothesis for the study. (6 marks)
- c) Write a suitable methodology for the study so that it addresses the following questions.
- i. What data is needed and where is it located? (3 marks)
 - ii. How to collect the data? (3 marks)

- iii. How to analyze the data? (3 marks)
- d) Explain the experimental design that you think would be the most suitable for the study. (6 marks)

QUESTION FOUR (25 MARKS)

- a) It has been said that the line between basic research and applied research is a thin one. Explain the implications of this statement. (4 marks)
- b) Suggest a topic that would be most suitable for basic research and another one for applied research. (4 marks)
- c) A double-blind experiment is sometimes preferred to other types of experiments.
 - i. Explain how you would go about designing a double-blind experiment. (4 marks)
 - ii. What considerations would you give towards controlling the threats to external validity of this experiment? (4 marks)
 - iii. State why other types of experimental designs would not be appropriate. (3 marks)
- d) It has been proven that different measurement scales come with different capabilities in terms of the data and statistics they permit. For each of the following scales of measurement, give the characteristics and possible statistics as appropriate. (6 marks)

Measurement scale	Characteristics of the scale	Possible statistics permitted
Ordinal scale		
Interval scale		
Ratio scale		

QUESTION FIVE (25 MARKS)

Study the attached paper entitled “An empirical study to evaluate the relationship of object-oriented metrics and change proneness” and then answer the following questions:

- a) State the problem under investigation in the paper . (4 marks)
- b) State the importance of the problem under study. (3 marks)
- c) What is the purpose of the study? (3 marks)
- d) Describe how data collection was handled. (5 marks)
- e) Explain the meaning of outliers and how they were handled. (3 marks)
- f) Suggest an alternative approach to handling outliers. (3 marks)
- g) Based on the conclusions, identify a new gap and then write a brief problem statement from it. (4 marks)