



# MACHAKOS UNIVERSITY

University Examinations for 2018/2019

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY

FOURTH YEAR SPECIAL/SUPPLEMENTARY EXAMINATION FOR

BACHELOR OF SCIENCE IN STATISTICS AND PROGRAMMING

SMA 493: DEVELOPMENT OF SOFTWARE ENGINEERING

DATE:

TIME:

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## INSTRUCTIONS

Answer **question ONE** and any other **TWO** questions.

### QUESTION ONE (COMPULSORY, 30 MARKS)

- a) Distinguish between:
  - i. Milestone and deliverable (2 marks)
  - ii. Generic and Customized Software Products (2 marks)
- b) In software engineering, why is measurement essential? (3 marks)
- c) What do you understand by program structure? (4 marks)
- d) Explain the major differences between software engineering and other traditional engineering disciplines (5 marks)
- e) What are the responsibilities of the top management in ensuring Software Quality? (6 marks)
- f) Describe briefly the following as used in software engineering
  - i. McCabe's Cyclomatic Complexity (4 marks)
  - ii. Albrecht's Function Point Method (4 marks)

### QUESTION TWO (20 MARKS)

- a) What do you understand by the following terms as used in software measurement
  - i. Software Quality Assurance. (2 marks)
  - ii. Software Quality Control (2 marks)

- b) Describe briefly the characteristics of software that make development of software quality assurance methodology and its successful implementation a professional challenge (Compare with other industrial products). (3 marks)
- c) Using an example in each case, briefly describe the THREE Measurement scales used for representing the empirical relation mappings (3 marks)
- d) What is the meaning of Good Data as used in software measurements? (3 marks)
- e) Briefly explain the Source lines of code (SLOC) metric of measurement (3 marks)
- f) Briefly explain when to apply the following tests in data analysis: (4 marks)
  - i. Student's t-test
  - ii. a chi-squared test

### QUESTION THREE (20 MARKS)

- a) What are the responsibilities of the top management in ensuring Software Quality? (5 marks)
- b) What are the benefits of Function Point Analysis (5 marks)
- c) In Function point analysis, what is the meaning of the following function types: (3 marks)
  - i. Internal Logical File (ILF)
  - ii. External Interface File (EIF)
  - iii. External Input (EI)
- d) According to McCabe Cyclomatic Complexity metric, what do you understand by the following terms?
  - i. Program structure? (5 marks)
  - ii. Directed Graphs? (2 marks)

### QUESTION FOUR (20 MARKS)

Attempt the following questions on Halstead's Software Metrics

- a) Describe briefly how Halstead's Software Metric works (5 marks)
- b) Given the following fragment of a program written in C programming Language, compute the following Halstead's Software Metrics(show how you arrive at your answer):
  - i. Potential Program Volume ( $V^*$ ) (3 marks)
  - ii. Program Level (L) (3 marks)
  - iii. Programming Difficulty (D) (3 marks)
  - iv. Programming Time (T) (3 marks)
  - v. Language Level (L) (3 marks)

*int sort (int x[ ], int n)*

```

{
    int i, j, save, im1;
    /*This function sorts array x in ascending order */
    If (n < 2) return 1;
    for (i=2; i < =n; i++)
    {
        im1=i-1;
        for (j=1; j < =im1; j++)
            if (x[i] < x[j])
            {
                Save = x[i];
                x[i] = x[j];
                x[j] = save;
            }
    }
    return 0;
}

```

#### QUESTION FIVE (20 MARKS)

- a) A given project has 5 user inputs, 10 user outputs, 7 inquiries, 5 files, and 3 external interfaces. All of these are average complexity EXCEPT 2 of the inputs are complex, two of the outputs are complex, and one of the outputs is simple. Adjustment factors are all moderate except that the system will require a significant amount of online data entry, and it is essential that the code is designed with reuse in mind. Calculate the number of Function Points for this system. (Show all your workings). (10 marks)
- b) Given the following program fragment written in C programming language, answer the following questions:

```

while (c) {

    x = y + 1;

    y = 2 * z;

    If(d) x = y + z;

    z = 1;

}

z = x;

```

- i) Draw a Directed graph for the program section (5 marks)
- ii) Compute the program section's Cyclomatic Complexity (5 marks)