B.Sc. Examination 2008

For External Students

COMPUTING AND INFORMATION SYSTEMS

210 Software Engineering and Development

[Western]

Duration: 3 hours

Date and Time : Wednesday 14 May 2008 : 10.00 – 1.00 pm

- *Full marks will be awarded for complete answers to FOUR questions. Do not attempt more than FOUR questions on this paper.*

- A hand held calculator may be used when answering questions on this paper but it must not be pre-programmed or able to display graphics, text or algebraic equations. The make and type of machine must be stated clearly on the front cover of the answer book.

THIS EXAMINATION PAPER MUST NOT BE REMOVED FROM THE EXAMINATION ROOM

`if x>0 then`
`  x:= 0;`
`if y=x then`
`  x:= 4*x;`
	`if x>0 then`
	`  x:= 0;`
	`if y=x then`
	`  x:= 5*x;`

Figure 1: A Mutant

Question 1.

(a) Software maintenance accounts for a large part of the software development life cycle. Explain why software maintenance is so expensive when compared to the maintenance of other engineering artefacts.

[10]

(b) Define static backward program slicing and explain, with the aid of an example, how it can be used to assist in program comprehension.

[10]

(c) Slicing has been suggested as a tool for assisting in debugging. However, slicing cannot locate bugs which reflect the omission of some important aspect of computation. Explain this observation, with the aid of an example.

[5]

Question 2.

(a) What is mutation testing? Your answer should include a definition of test coverage in terms of mutation testing.

[8]

(b) What is the equivalent mutant, problem? Illustrate you answer with an example.

[8]

(c) Consider the program in the left-hand section of Figure 1. A mutated version of the program is depicted in the right-hand section of the figure. Give one test case which would kill this mutant and one which would fail to kill the mutant.

[4]

(d) What is the infeasible path problem and how is it related to mutation testing? Illustrate with an example.

[5]

Question 3.

(a) Explain the statement "High coupling is undesirable in a software system". Why is some level of coupling unavoidable?

[5]

(b) Define the seven levels of cohesion that one or more modules of a software system might exhibit. Give a simple example in pseudo code that illustrates each level of cohesion.

[14]

(c) Explain the difference(s) and similarity (or similarities) between stamp coupling and data coupling, with an example, written in pseudo code.
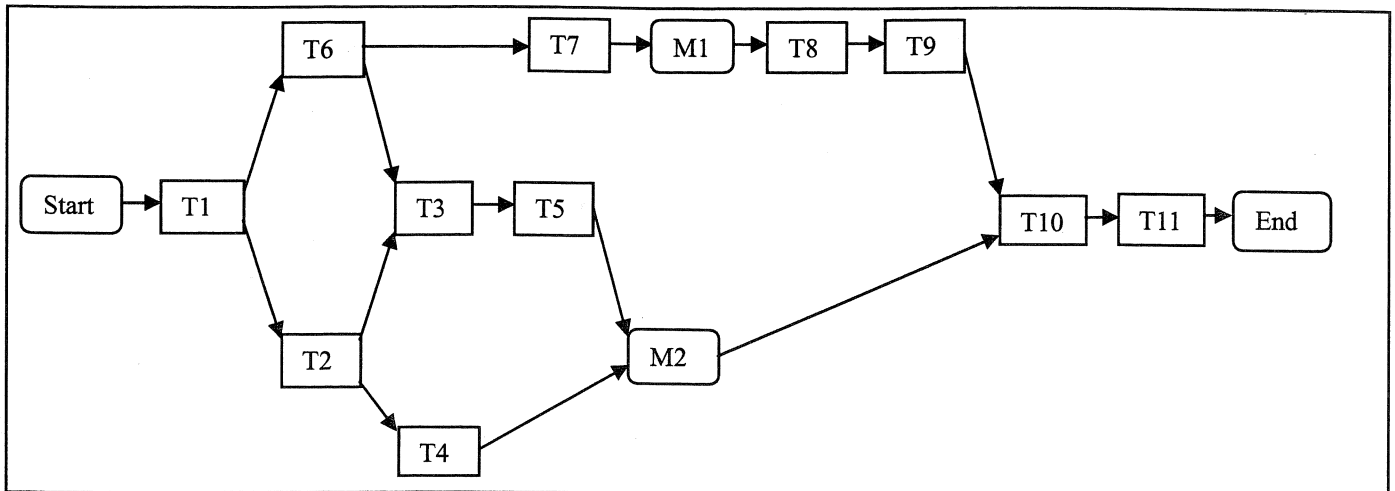
[6]

Figure 2: A PERT Chart

Question 4.

(a) Consider the PERT chart depicted in Figure 2. Draw a Work Breakdown Schedule, from which this PERT chart could have been created.

[10]

(b) Draw the Gantt Chart which would be created from this PERT chart.

[10]

(c) Given some arbitrary PERT chart c, what is the Critical Path in c?

[2]

(d) What is the critical path for the PERT chart, shown in Figure 2?

[3]

Question 5.

(a) Describe, in detail, the two software development methods known as the waterfall model and the spiral model. Your answer should include a diagrammatic depiction of each of the two software development methods.

[15]

(b) Describe the properties of a project for which the waterfall model is most ideally suited.

[5]

(c) Describe the properties of a project for which the spiral model is most ideally suited.

[5]

Question 6.

(a) Briefly describe the approach of formal proof in establishing program correctness. Give one advantage and one disadvantage of this approach.

[6]

(b) What is the Pareto Principle in the context of software faults? How is this principle applied to maximize the effect of fault-reduction effort?

[4]

(c) Briefly define the terms **black box** and **white box** testing.

[4]

(d) Define the terms **fault** and **error** in the context of software systems. Give an example of a system where there is a fault but no error. Give an example of a system where there is an error but no fault.

[9]

(e) It is sometimes said that all software systems of a sufficient size will definitely contain faults. Provide a brief argument which either supports or refutes this conjecture.

[2]

END OF EXAMINATION