SOFTWARE ENGINEERING – BITS UC461
COMPREHENSIVE EXAMINATION (Closed Book)

Date: 20 May 2007
Time: 3 hrs
   Max Marks: 80

Answer all questions

Part A (20 mks)

All questions carry equal marks

1. Explain what is wrong with the notion that computer software does not need to evolve over time.
2. Name the stages in the waterfall model. What are its strengths and weaknesses.
3. Write two user-oriented functional requirements for the spell-checking and correcting feature of a typical word processor.
4. What are the names of the different levels of the SEI Capability Maturity Model? In your own words, briefly describe each.
5. With the help of an example explain the difference between includes and extends in a use case diagram
6. A drinks vending machine can dispense coffee with and without milk and sugar. The user deposits a coin and makes a selection by pressing a button on the machine. This causes a cup with powdered coffee to be output. The user places this cup under a tap and presses another button and hot water is dispensed. At any stage the user can cancel and have their money returned. Draw a simple state chart to model this vending machine.
7. What are the different techniques for debugging. Explain each technique briefly?
8. What is coupling? Explain briefly the different types of coupling
9. Give the cyclomatic complexity and the matrix representation of the control flow
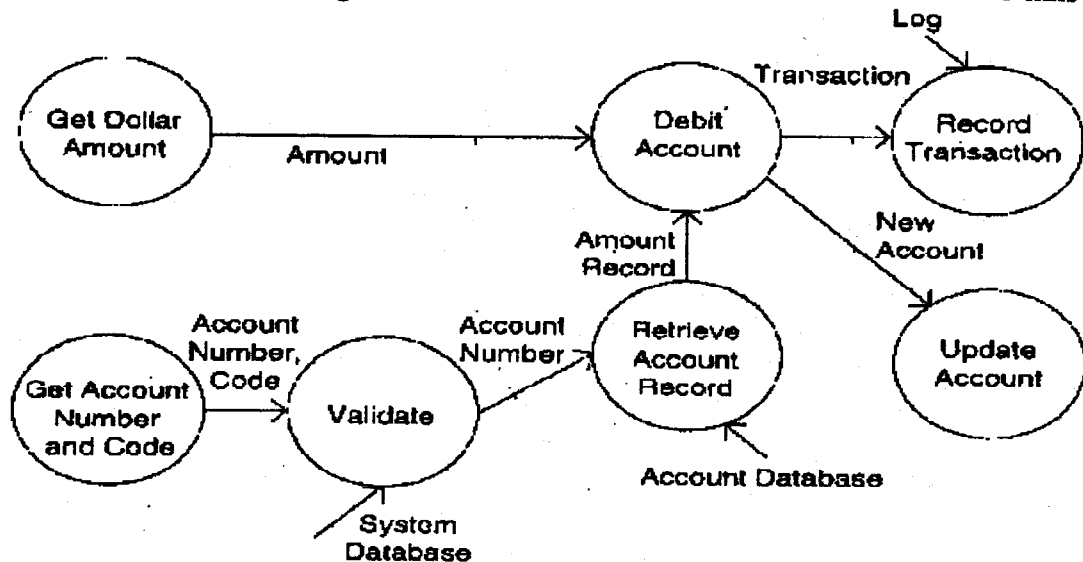
Figure1: Control flow graph
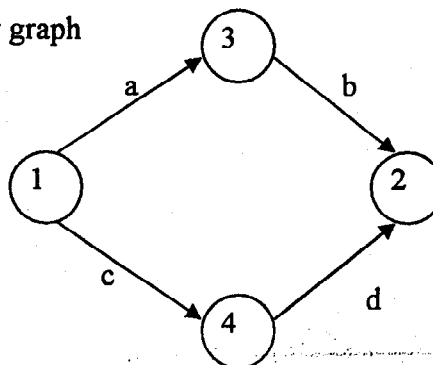
graph.given in Figure 1.

10. Describe the change control process for a modern software development project.

Part B (60 mks)

11. a) Convert the following DFD into a structure chart   5 mks

b) Suppose that for a bank database there are two commands allowed:
   i) credit acct_number transaction_amount
   ii) debit acct_number transaction_amount

The requirements are that if the command is credit and the acct_number is valid, then the account is credited. If the command is debit, the acct.number is valid, and the transaction_amount is valid (less than the balance), then the account is debited. If the command is not valid, the account number is not valid, or the debit amount is not valid, a suitable message is generated. We can identify the following causes and effects from these requirements: 5 mks

Causes:
c1. Command is credit
c2. Command is debit
c3. Account number is valid
c4. Transaction_amt is valid

Effects:
e1. Print "invahd command"
e2. Print "invalid account_number"
e3. Print "Debit amount not vahd"
e4. Debit account
e5. Credit account

Draw a decision table for the above problem

12. What are the different kinds of architectural styles. Explain each with the help of an example.   10 mks

13. a) Differentiate between black box and white box testing. What are the advantages of each approach? Why are both necessary?   5 mks

b) Consider a simple program to classify a triangle. Its input is a triple of positive integers (say x, y, z) and the data type for input parameters ensures that these will be integers greater than or equal to zero or less than or equal to 200. The program output may be one of the following words: "scalene","isosceles", "equilateral", "not a triangle". Design the boundary value test cases   5 mks

14. a) How does a UML class diagram handle the concept of inheritance? Name two other object oriented concepts that may be modeled with a UML class diagram
5 mks.

b) A hotel clerk uses the following process when someone calls the hotel to make a reservation: First the guest is asked what nights they want to stay and for how many people. The clerk uses the system to verify that room(s) are available on those nights. If rooms are available, the clerk asks the guest if he or she is a Hotel Club member. If so, then the clerk types in the guest's hotel club member; immediately detailed information about the guest appears on the screen. If the guest is not a hotel club member then the clerk ask for basic information about the guest: Name, address, telephone number etc. Following verification of the guest's information, the reservation is completed. Model the requested aspect of a system using an appropriate UML diagram.   5 mks

15. a) There are two measures for estimating the cost of a project. What are they? Explain and discuss the metrics and their pros and cons.   5 mks

b) Consider a semidetached project to develop a full screen editor. The major components identified are (i) Screed Edit (ii) Command Language Interpreter (iii) File Input and Output (iv) Cursor Movement and (v) Screen Movement. The sizes for these are estimated to be 4K, 2K, 1K, 2K, 1K, 2K and 3K delivered source code lines. Use COCOMO model to determine the overall effort. List any four cost drivers and assume values for them for computing the effort. (The values of a and b for a semidetached project are 3 and 1.12)   5 mks

16. Write short notes on the following: 10 mks
    a)   Software quality assurance
    b)   Architectural Design Metrics
    c)   Maintenance metrics

Date: 25 Feb 2007
Time: 50 min

Max Marks: 20

Answer all questions

1. Distinguish between a program and a software product   1 mk

2. Distinguish between embedded software and artificial intelligence software. Give an example for each kind.   4 mks

3. Is the following statement true or false. Justify your answer with proper reasoning:
"The reliability of a software product increases almost linearly, each time a defect gets detected and fixed"   2 mks

4. Which of the life cycle models would you follow for the following projects? Describe the suggested model and justify your choice.   4 mks
   a) A well-understood data processing application
   b) A data entry system for office staff who have never used computers before

5. Identify the framework activity under which the following tasks can be defined. Give your justification   3 mks
   a) Make a list of stakeholders for the project
   b) Determine estimates of effort and cost

6. Distinguish between total participation of an entity in a relationship and the cardinality of entities in a relationship, with the help of an example.   2 mks

7. Draw the context level diagram and the data flow diagram for the following maintenance system: 4 mks

A computer manufacturer sells the complete range of PCs. This company also maintains the machines it sells after entering into an annual maintenance contract. Every year this contract has to be renewed for a certain amount. The company is responsible for all maintenance activities.
To attend to customer complaints the company has, on its rolls, a large number of hardware engineers. As and when a complaint is received by the maintenance system, it is entered on a slip, after verifying if the customer has entered into an annual maintenance contract from its data base. These slips are collated and a list is prepared which is handed over to hardware engineers every morning. During maintenance, hardware engineers use spare parts. After hardware engineers attend to the customer calls, the complaints and parts used are passed to the maintenance system where they are updated. The system sends stock report to the head office every month.