BLG411E - Software Engineering
Midterm Exam - 13.11.2007

- Books and notes are closed.
- Exam help sheet, calculator, and dictionary are allowed.
- Exam duration is 1.5 hours.

PROBLEM (70 points)

Suppose you have been asked to develop Traffic Monitoring System (TMS) for Istanbul Municipality. The followings are requirements:

- TMS provides a real-time model of traffic flow in Istanbul by converting information from sensors and other monitoring information into a graphical representation of the major motorways and streets in city, their load, and the average traffic flow.

- TMS contains a static model of towns in the city, streets, lanes, and intersections, as well as dynamic information from sensors about the state of stop lights and traffic flow.

- A TMS operator monitors police reports and can update the model if roads close or accidents occur.

- TMS distinguishes between different vehicles such as cars, trucks, motorcycles, and busses, and different roads such as highways, streets, hospital zones, and so forth.

- TMS answers queries by users such as: How long will it take to get from Point A toPoint B given the current traffic state? How many people can get from Point A to Point B in an hour? What would happen if Street B were to close right now?

Question 1 [70 points]

a) [15 points] Using the Function Points method, estimate the LOC for the software. Assume that the implementation will be in C language with a 130 LOC/FP.
b) [10 points] Using the Basic COCOMO method, estimate the effort and the development time; and determine number of people.
c) [10 points] Identify the main activities and draw a Task Network.
d) [15 points] Draw an entity-relationship diagram.
e) [10 points] Draw level-1 data flow diagram.
f) [10 points] Draw hierarchical architectural design chart.

Question 2 [10 points]

Recommend the most appropriate software process model for each of the followings.

a) [2 points] A mobile-phone application involving new technology.
b) [2 points] A payroll application whose requirements are well defined in advance.
c) [2 points] An enterprise application in which reusability is important.
d) [2 points] A safety-critical industrial application.
e) [2 points] An accounting application with intensive user interface.

TEST QUESTIONS (30 points)

Question 3 [2 points] The incremental model of software development is
a. A reasonable approach when requirements are well defined.
b. A good approach when a working core product is required quickly.
c. The best approach to use for projects with large development teams.
d. A revolutionary model that is not used for commercial products.

Question 4 [2 points] Why is it important to measure the process of software engineering and software it produces?
a. It is really not necessary unless the project is extremely complex.
b. To determine costs and allow a profit margin to be set.
c. To determine whether a software group is improving or not.
d. To make software engineering more like other engineering processes.

Question 5 [2 points] The objective of software project planning is to
a. convince the customer that a project is feasible.
b. make use of historical project data.
c. enable a manager to make reasonable estimates of cost and schedule.
d. determine the probable profit margin prior to bidding on a project.

Question 6 [2 points] The most common way to determine the information needed to define project scope is to
a. conduct a preliminary meeting with the customer.
b. examine historical project data from similar applications.
c. build a software prototype and show it to the customer.
d. perform a market analysis to determine potential customers.

Question 7 [2 points] Three categories of risks are
a. business risks, personnel risks, budget risks
b. project risks, technical risks, business risks
c. planning risks, technical risks, personnel risks
d. management risks, technical risks, design risks

Question 8 [2 points] The task (activity) network is a useful mechanism for
a. computing the overall effort estimate
b. detecting inter-task dependencies
c. specifying the task set to the customer
d. none of the above

Question 9 [2 points]. Which of these activities is not one of the activities recommended to be performed by an independent SQA group?
a. prepare SQA plan for the project
b. review software engineering activities to verify process compliance
c. report any evidence of noncompliance to senior management
d. serve as the sole test team for any software produced

Question 10 [2 points] Which of the following are objectives for formal technical reviews?
a. allow senior staff members to correct errors
b. assess programmer productivity
c. par determining who introduced an error into a program
d. uncover errors in software work products

Question 11 [2 points] Which of the following tasks is not part of software configuration management?
a. change control
b. reporting
c. statistical quality control
d. version control

Question 12 [2 points] The system specification describes the
a. function and behavior of a computer-based system
b. implementation of each allocated system element
c. algorithmic detail and data structures
d. time required for system simulation

Question 13 [2 points] What types of models are created during software requirements analysis?
a. functional and behavioral
b. algorithmic and data structure
c. architectural and structural
d. usability and reliability

Question 14 [2 points] Which of the following is not an objective for building an analysis model?
a. define set of software requirements
b. describe customer requirements
c. develop an abbreviated solution for the problem
d. establish basis for software design

Question 15 [2 points] Which of these is a characteristic of a good design?
a. exhibits strong coupling between its modules
b. implements all requirements in the analysis model
c. includes test cases for all components
d. incorporates source code for descriptive purposes

Question 16 [2 points] When the information flow in a segment of a data flow diagram is characterized by a single item that triggers other data flow along one of many paths _____ is present.
a. high coupling
b. poor modularity
c. transaction flow
d. transform flow

Question 17 [2 points] A program design language (PDL) is often a
a. combination of programming constructs and narrative text
b. legitimate programming language in its own right
c. machine readable software development language
d. useful way to represent software architecure

HELP SHEET FOR EXAM

Function Points Formula:
FP = CountTotal * (0.65 + 0.01 * CAFTotal**)**

Measurement Parameter	Simple	Average	Complex
Number of user inputs	3	4	6
Number of user outputs	4	5	7
Number of user inquiries	3	4	6
Number of files	7	10	15
Number of external interfaces	5	7	10

Complexity Adjustment Factors (CAF):

Factor	**Range**
1.Backup and recovery	0-5
2.Data communications	0-5
3.Distributed processing	0-5
4.Performance critical	0-5
5.Existing operating environment	0-5
6.On-line data entry	0-5
7.Input over multiple screens	0-5
8.Files updated on-line	0-5
9.Information domain values complex	0-5
10.Internal processing complex	0-5
11.Code designed for reuse	0-5
12.Installation of software	0-5
13.Multiple installations	0-5
14.Application designed for change	0-5

Basic COCOMO:

$pm = a * KLOC^b$

$t_{dev} = c * pm^d$

Software Category	a	b	c	d
Organic	3.2	1.05	2.5	0.38
Semi-detached	3.0	1.12	2.5	0.35
Embedded	2.8	1.20	2.5	0.32

CAF Scale:

0=No influence
1=Incidental
2=Moderate
3=Average
4=Significant
5=Essential