UNIVERSITY OF LONDON

291 0210E

B.Sc. Examination 2005
FOR EXTERNAL STUDENTS

COMPUTING AND INFORMATION SYSTEMS

CIS210 Software Engineering and Development

[Eastern]

Duration: 3 hours

Date and time: Thursday, 12 May 2005 : 10.00am - 1.00pm

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

THIS EXAMINATION PAPER MUST NOT BE REMOVED FROM THE EXAMINATION ROOM

UL05/764

Question 1.

a) Contrast the reliability characteristics of software systems and hardware systems. Your answer should include graphs of reliability for hardware and for both well designed and poorly designed software. **[7]**

b) What is meant by internal and external qualities of software product? Describe three of the principal internal qualities of software. **[7]**

c) Distinguish between direct and indirect metrics used for measuring software complexity. Name two of each. **[6]**

d) Explain each of the following phases of the planning process: Bounding, Decomposition, Planning. **[5]**

Question 2.

a) What is the Pareto principle, and how does it lead to the notion of *vital few* causes of failures? **[5]**

A company does some defect tracking and derives the following table of causes of errors.

	Serious		**Moderate**		**Trivial**		**Total**	**Percentage**
Cause	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Misinterpretation of specification	40	51	20	37	22	17	82	31
Human-Computer Interface fault	25	32	1	2	6	4	32	12
Inconsistent module interface	4	5	12	22	13	10	29	11
Error in design-to-code translation	3	4	2	4	6	4	11	4
Flawed communication with user	2	3	2	4	30	23	34	13
Incomplete documentation	2	3	1	2	13	10	16	6
Error in data representation	1	1	10	18	12	9	23	9
Problem with compiler	1	1	3	5	12	9	16	6
Operating System mismatch	0	0	2	4	8	6	10	4
Miscellaneous	0	0	1	2	10	8	11	4
Total	78	100	54	100	132	100	264	100

b) Does the Pareto principle hold for these faults? Explain your answer. **[7]**

c) Is there a restriction on the kinds of defects for which the notion of a vital few cases manifests itself in the above table? Explain your answer. **[8]**

d) Suppose that the company wants to concentrate on serious defects only. What steps should the company take to lighten the problem of faults? **[5]**

Question 3.

a) What information can be gleaned from a critical path analysis of a software design process? **[8]**

b) Consider the task of developing a software library information system. The scheduling of this system must account for the following requirements:

The following tasks are necessary

- (T1) make a control terminal class, maximum time 3 days
- (T2) design student user, maximum time 3 days
- (T3) design faculty user, maximum time 4 days
- (T4) design protocol, maximum time 4 days
- (T5) design of network management routines, maximum time 5 days
- (T6) make a database called library directory, maximum time 3 days
- (T7) design overall control, maximum time 7 days
- (T8) definition of university users, maximum time 5 days
- (T9) definition of university staff, maximum time 5 days
- (T10) testing, 7 days

The time dependencies are given by

T2 cannot start until T1 is finished; T3 cannot start until T1 is finished; T4 cannot start until T2 is finished; T5 cannot start until T4 is finished; T6 cannot start until T2 is finished; T7 cannot start until both T5 and T6 are finished; both of T8 and T9 need T7 to finish before they begin and T10 needs T8 and T9 to finish before it starts.

Develop a Task Network for scheduling the development of this task where each subtask is associated with its starting time, assuming the start time for the whole system is 7/9/2005.

[10]

(c) What is the earliest time you can schedule T7 to begin? Explain your answer. **[7]**

Question 4.

(a) Briefly describe the main features of a Booch Class Diagram. **[10]**

(b) Draw a Booch class diagram that describes *ComputersRUs Shop sales system*:

The computer hierarchy in the sales system the abstract class `Computer` has two subclasses: `IBM` and `Macintosh`; the class `IBook` inherits from `Macintosh`.

A private attribute of the `Computer` class is `stock`; a public method is `ReturnPrice`. The `Computer` class serves to keep track of the basic public of `processor speed and price`, which next may be provided for storing into the database.

The available books are maintained in a public class variable `listofComputers` in a `ComputerDatabase`. The particular `Computeritems` could be loaded with information about their processor speed, and price.

The `InventoryController` has the responsibility of tracking sales of each computer and maintaining an appropriate supply. Aggregated within `InventoryController` is one supporting class `MarketAnalysis`. The `MarketAnalysis` has private functions for `CalculateDailySales` and `CalculateMonthlySales`, as well as a public function `ReturnSalesInfo`.

[15]

Question 5.

a) What are the main components of a State Transition Diagram (STD)? **[5]**

b) Draw an STD for a washing machine. The tasks that the machine can perform are: filling, washing, spinning, and heat drying, and when they are all done, they are done in that order. The machine user can choose among washing cycles: only wash/dry uses the heat drier; ordinary uses everything else; delicate washes avoid spinning. The user can also choose to use either hot or cold water. **[20]**

Question 6.

(a) Give a brief account of cognitive psychology and the information processing framework for human cognition. **[10]**

(b) Describe three psychological results that have an effect on the design of software and describe those effects. **[15]**