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BSc Programmes in Computing

Level 1 Examination

CS183: Systems Analysis and Design

Time allowed: 2 hours     Spring Semester 2007

Answer ALL questions in Section A
and TWO questions from Section B.

*IMPORTANT*
WRITE YOUR URN HERE .............................................................

THIS QUESTION PAPER SHOULD BE HANDED IN AT THE END OF THE EXAMINATION

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SECTION A - Answer ALL 40 questions in this section [one mark each]. *(answers are in bold)*

1. The person that identifies opportunities for improvements and designs an information system to implement them is called a(n) _____.
   
   A. computer programmer
   B. end-user
   C. systems analyst
   D. systems specialist
   E. technical writer

2. The four phases of the Systems Development Life Cycle are _____.
   
   A. analysis, gathering, modeling, and diagramming
   B. construction, installation, testing, and converting
   C. designing, charting, formatting, and structuring
   D. planning, analysis, design, and implementation
   E. system request, feasibility, planning, and staffing

3. The project sponsor is the _____.
   
   A. lead systems analyst on the project team
   B. person or department that requested the system
   C. computer programmer who writes the code for the system
   D. project team leader in charge of developing the system
   E. any of the above may fill the role of the project sponsor

4. Deciding how the hardware, software, and network infrastructure will operate occurs during the _____ phase of the SDLC.
   
   A. analysis
   B. design
   C. implementation
   D. planning
   E. strategy
5. The phase of the SDLC when the system is actually built or purchased is the _____ phase.
   A. analysis  
   B. construction  
   C. design  
   D. implementation  
   E. planning

6. _____ development is a structured design methodology that proceeds in a sequence from one phase to the next.
   A. Parallel  
   B. Phased  
   C. Prototyping  
   D. Rapid Application  
   E. Waterfall

7. The idea of placing data and the processes (methods) that operate on the data into the same object is referred to as _______________.
   A. information hiding  
   B. polymorphism  
   C. object binding  
   D. encapsulation  
   E. inheritance

8. A(n) __________ models the interaction of the information system with its end-users and other external systems.
   A. implementation plan.  
   B. use case diagram.  
   C. class diagram.  
   D. package diagram.  
   E. database diagram.
9. _______ represent the things, concepts or ideas that are contained in an application.
   A. Interaction diagrams
   B. Deployment diagrams
   C. Sequence diagrams
   D. **Class diagrams**
   E. Use Case diagrams

10. Understanding the as-is system, identifying improvements, and developing requirements for the to-be system are the steps of the _____ phase.
    A. **analysis**
    B. design
    C. implementation
    D. planning
    E. SDLC

11. Sarah would like to give the interviewee more control over the interview and to gather rich information. She should ask _____ questions.
    A. closed-ended
    B. inappropriate
    C. **open-ended**
    D. opinion
    E. probing

12. A JAD session can _____.
    A. Allow all the users to be interviewed at once
    B. Enable feedback after installation of a new system
    C. Teach the managers to draw the UML diagrams
    D. **reduce scope creep by 50%**
    E. allow observation techniques to be employed
13. A JAD facilitator is _____.

A. the person who sets the meeting agenda and guides the discussion  
B. the person who records the discussion  
C. participates in the discussion  
D. is also a power user  
E. none of the above

14. What information-gathering strategy enables the analyst to see the reality of the situation rather than listen to others describe it?

A. document analysis  
B. interviewing  
C. joint application design (JAD) sessions  
D. observation  
E. questionnaires

15. Which of the following diagramming symbols represents a subject boundary in a use case diagram?

A  
B  
C  
D  
E
16. A(n) _____ use case is typically created early in the process of understanding the system
requirements as a way of documenting basic information about the use case.

A. overview  
B. detail  
C. essential  
D. real  
E. imaginary

17. The correct sequence of the major steps in creating use case diagrams is _____.

A. identify the major use cases, expand the major use cases, confirm the major use
cases, create the use-case diagram  
B. identify the major use cases, expand the major use cases, create the use-case diagram,
confirm the major use cases  
C. create the use-case diagram, identify the major use cases, expand the major use cases,
confirm the major use cases  
D. create the use-case diagram, identify the major use cases, confirm the major use cases,
expand the major use cases  
E. identify the major use cases, confirm the major use cases, expand the major use cases,
create the use-case diagram

18. If a “student signs up for a course module,” which type of relationship would you use to
model the relationship between the two?

A. generalization  
B. association  
C. aggregation  
D. subsetting  
E. vague

SEE NEXT PAGE
19. A class diagram is a(n) _____ model.
   A. **static**
   B. dynamic
   C. evolving
   D. obsolete
   E. none of the above

20. A(n) _____ is an instantiation of a class.
   A. attribute
   B. behaviour
   C. operation
   D. message
   E. **object**

21. _____ are information that is sent to objects to tell it to execute one of its behaviours.
   A. Attributes
   B. Operations
   C. **Messages**
   D. Instances
   E. Use-cases

22. Which of the following objects would be most likely to be destroyed at some point in time in a sequence diagram?
   A. customer
   B. order
   C. order item
   D. invoice
   E. **shopping cart/basket**
23. The focus in a sequence diagram is on __________________
   
   A. how actors interact with objects to realize a given use case
   B. messages sent by actors to other objects
   C. when an object is being created
   D. when messages are being destroyed
   E. time ordering of messages being passed between objects

24. In a sequence diagram, conditional messages are indicated by placing the condition between _____ symbols.
   
   A. < >
   B. “ “
   C. ‘ ’
   D. [ ]
   E. / /

25. To avoid the classic design mistake of “silver bullet syndrome,” the analyst should _____.
   
   A. increase the schedule to include learning time
   B. move proposed changes into future versions
   C. not switch or upgrade development tools unless there is a compelling need
   D. not use a design tool that appears too good to be true
   E. use rapid application development techniques or timeboxing operation

26. There are three methods to create a new system. They are _____.
   
   A. buy a package, external vendor, external service provider
   B. develop custom application in-house, external service provider, and external vendor
   C. external service provider, rely on a developer, and external vendor
   D. in-house custom application, buy a package, and external vendor
   E. in-house custom application, external service provider, and external vendor
27. The following are all strengths of a custom development design strategy EXCEPT _____.
   A. builds technical skills
   B. greater creativity
   C. greater flexibility
   D. lower risk
   E. none of the above

28. An advantage of purchasing packaged software is that the organisation can _____.
   A. accept functionality that is not a perfect fit
   B. build technical skills and functional knowledge
   C. have developers climb the knowledge ladder
   D. make strategic changes during implementation
   E. save money on the purchase

29. A disadvantage of purchasing packaged software is that the organization may _____.
   A. accept functionality that is not a perfect fit
   B. build technical skills and functional knowledge
   C. make strategic changes during implementation
   D. remove all risk from the project
   E. save money on the purchase

30. Data may be stored in the following formats _____.
   A. databases
   B. entities
   C. entities and files
   D. files
   E. files and databases
31. A relational database may be optimized for _____.
   A. data type and storage efficiency
   B. relational type
   C. speed of access
   D. storage efficiency
   **E. storage efficiency and speed of access**

32. A(n) ____ occurs when data are stored redundantly in a database and only some of the instances are updated when a change is needed.
   A. error
   **B. update anomaly**
   C. data integrity concern
   D. storage efficiency
   E. none of the above

33. If the data model does not have any repeating fields it is, at least, in _____.
   A. base normal form
   **B. first normal form**
   C. non-normal form
   D. second normal form
   E. third normal form

34. A mini-table that contains values from one or more columns in a table and the location of the values within the table is called a(n) _____.
   A. index
   **B. interfile cluster**
   C. intrafile cluster
   D. raw data calculation
   E. volumetric
35. When information systems projects fail, the primary reason has traditionally been _____

   A. improperly trained programmers
   B. inadequate planning
   C. **poor analysis, design, installation, or project management**
   D. poor programming
   E. shortened testing periods

36. A classic mistake made during the implementation phase is to _____.

   A. create a risk assessment
   B. maintain control over the code
   C. plan for the use of state-of-the-art technology
   D. spend too much time in testing
   E. **use low cost personnel**

37. _____ allow hiding everything in a part of the system behind a visible interface, making testing difficult.

   A. **Encapsulation and information hiding**
   B. Polymorphism and dynamic binding
   C. Inheritance
   D. Reuse
   E. Object-oriented development processes

38. Post-implementation activities include _____.

   A. project assessment
   B. system maintenance
   C. system support
   D. system support and system maintenance
   E. **system support, system maintenance, and project assessment**
39. The conversion style that recommends operating the new system along side the old system for a trial period is known as ______.

   A. direct
   B. parallel
   C. phased
   D. pilot
   E. simultaneous

40. The process of refining the system to make sure that it continues to meet business and organizational needs is called ______.

   A. change management
   B. project assessment
   C. system maintenance
   D. system review
   E. system support

[Total for Section A: 40 marks]

SEE NEXT PAGE FOR SECTION B
SECTION B -

1.

(a) PHASED DEVELOPMENT [2 marks]

ADVANTAGES:
Allows release of several versions of the system, each with increasing degree of functionality and features. [2 marks]
This allows users to have 'something' they can use or test at an earlier stage than is possible with the waterfall methodology. All the SDLC phases have to be complete with Waterfall methodology before the user sees a working product, and each of these phases has to be complete before moving to the next one. [4 marks]

[total Q1(a) 8 marks]

(b) SYSTEM PROTOTYPING (PROTOTYPING):

In system prototyping (aka. prototyping), the prototype is successively modified until it becomes the final system. This can be relatively quick, but can result in early bugs being carried through to the final system. This is not the favourite choice when the final system is safety critical.
THROWAWAY PROTOTYPING (DESIGN PROTOTYPING):

In throwaway prototyping (aka design prototype), a prototype is developed to show the users what the system will finally look like (without the main functionality), or to provide a chance for the developers to learn as they go along with relatively novel technologies. As such, the prototype is 'thrown away' when it has served its purpose, and the final system is now designed and implemented (using knowledge gained during the production of the design prototype). Bugs and other problems appearing during the development of the prototype are thus NOT carried through to the final system. So this is the favourite choice when the final system is safety critical.

[8 marks]

[total for Q1(b)16 marks]

(c) PHASED DEVELOPMENT (as in the diagram) is best for OOD because it allows iterative and incremental development. Also, it allows good feedback from users between releases - this facilitates OO development (throwaway prototyping would also be good for the latter, but it only really allows for one 'quick and dirty' release to the users, followed by a full release, not a series of working and useful versions).

[6 marks]
2.

(a) **CLIENT**
    The part of the system that is on the actual user’s desk (or in his/her hand) eg. terminals, PCs and special-purpose terminals such as ATMs (automated teller machines) and EPOS (electronic point of sale) terminals, PDAs.

**SERVER**
    The part of a computer system that is usually accessed remotely, eg. mainframes, minicomputers, and (increasingly, with better processing power and storage capacity) microcomputers, such as PCs.

(b) **application logic**: the main program itself
    **presentation logic**: the user interface, GUI, windowing system, user I/O i.e that involves the presentation of information to the user, and the acceptance of the user’s commands
    **data access logic**: The computer processing (logic) required to access data i.e. the interface to the database, e.g. SQL commands etc.
    **data storage**: the database itself e.g. MS-Access, SQL Server, etc.

A 2-tiered system will have at least one CLIENT (but usually many), and at least one SERVER. The logic is distributed as follows:

**SERVER**: data access logic plus data storage

**CLIENT**: presentation logic plus application logic

A 3-tiered system will have at least one CLIENT (but usually many), an APPLICATION SERVER, and a DATABASE SERVER. The logic is distributed as follows:

**APPLICATION SERVER**: application logic

**DATABASE SERVER**: data access logic plus data storage

**CLIENT**: presentation logic plus application logic

[total 6 marks]

[3 marks]

[8 marks]
Client-server systems are more scalable than purely server-based systems. Scalability refers to the ability to increase or decrease the capacity of the computing infrastructure in response to changing capacity needs. Client-server computing is the most scalable architecture because servers can be added to (or removed from) the architecture when processing needs change. This helps to spread the processing and network traffic load. Also, the types of hardware that are used in client-server (e.g., minicomputers) typically can be upgraded at a pace that most closely matches the growth of the application. If a system has high scalability, it means that it is easy to decrease or increase the processing and storage capabilities of the system. E.g., if one server becomes overloaded, you can just add another server and move some application or data storage to it. The effect of improving scalability of a system would be to make it easy to add functionality or applications without severely affecting performance. Also, in client-server systems, since the application resides (probably mainly) on the client, the network traffic is less than would be with server-based systems.

Client-server systems can support many different kinds of vendors and operating systems. However, one major problem is one of complexity - it is necessary to have server parts and client parts of applications, and this can add to support and training overheads.

3. (a) [15 marks]
(b) 

**STATE** - a static state (or state of constant repeating action) as rounded rectangles on the diagram eg. 'In process', 'shipped'.

[3 marks]

**TRANSITION** - the process of changing state, shown as arrows on the diagram.

[3 marks]

**EVENT** - the trigger for the transition, shown as text above arrows in the diagram.

[3 marks]

[9 marks]

(c) Behavioural models show the changes over time, ie. they are *dynamic*. They show changes of state of an object over the lifecycle of that object, or messages being sent between objects and their relative order in time. Structural models, on the other hand, just show a static view of the system.

[6 marks]

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