

BITS, Pilani – Dubai Campus, Knowledge Village, Dubai.

IV Year Second Semester 2004-2005

Degree: B.E.(Hons.). Branch: C.S.

Comprehensive Examination Question Paper

Course No : BITS UC461 Course Title: Software Engineering

Date: 22/05/2005 Sunday Time: 10 a.m.- 1 Noon Total marks: 60

Weightage: 40% Data provided are complete. **Closed Book**. 3 pages on paper.

Part A Answer all Questions. 10 * 2 = 20 Marks

1. What are the characteristics of Engineering and Scientific Software? Mention any two applications in this category.
2. What does an Information Structure represent, in Analysis phase?
3. What is Control Coupling w.r.t. Design?
4. Mention the names of the framework activities in User Interface Design process.
5. When will you deploy *Incremental Model* for software development.
6. In CASE, what is a REENGINEERING TOOL?
7. What is **software safety**?
8. Write the equation for computing *Software Maturity Index* [SMI].
9. Draw the flow graph notation for the following constructs:
While if
10. What is a Timeline/Gantt Chart? Where is it used?

Part B Answer all Questions. 4 * 5 = 20 Marks

11. Compute the **Count** for each of the **measurement parameter** (ie. a)Number of *user inputs*, b)Number of *user outputs*, c)Number of *user inquiries*, d)Number of *files* and e)Number of *external interfaces*) for a project with the following characteristics:
 - **Weighting Factor** for each *Measurement Parameter* = 4.
 - each **complexity adjustment value** = 5.
 - FUNCTION POINTs (FP) = 486.
 - The **ratio of counts** for the **measurement parameters** is 1 : 2 : 3 : 2:1 respectively.
(As mentioned above, a, b, c, d, e, in the same order).
12. Explain *software configuration items* and *configuration objects* in SCM.
13. Explain the *Debugging Approaches* in software testing strategies.

14. DECISION TREE to support the Make/Buy Decision

You are required to **DRAW a Decision Tree** for a Software Based System X and calculate the **expected cost** for each of the following paths of the **Decision Tree**:

i) *BUILD* ii) *REUSE* iii) *BUY* iv) *CONTRACT*.

Which one of the options [paths] gives the **Lowest Expected Cost** ?

You are provided with the following data related to the above four cases:

i) *BUILD*

Development Effort	Probability	Estimated Cost
SIMPLE	35%	\$260K
DIFFICULT	65%	\$420K

(Note: 1K = 1000)

ii) *REUSE*

Development Effort	Probability	Estimated Cost
MINOR CHANGES	20%	\$300K
MAJOR CHANGES	80%	\$400K

iii) *BUY*

Development Effort	Probability	Estimated Cost
MINOR CHANGES	50%	\$250K
MAJOR CHANGES	50%	\$420K

iv) *CONTRACT*

Development Effort	Probability	Estimated Cost
WITHOUT CHANGES	40%	\$250K
WITH CHANGES	60%	\$400K

15. UML CLASS DIAGRAM: You are to draw an appropriate UML Class Diagram for this problem.

The following partial system description refers to a University Student and Course Information System.

A university system keeps track of students. There are two types of student: research and taught. In the case of taught student there are Masters students and Degree students. All students have the common attributes of name and address but for a masters student a record of their first degree and the grade achieved is held. For degree students a record is held of their secondary level points score and the number of credit points they have achieved. For research students the title of their project is held. For each student a mark is held for each module that they take. The mark consists of a coursework mark and an exam mark. The coursework weighting is held and for each item of coursework there is a description and the fraction of the total coursework mark it constitutes. In the case of exam mark, just the exam mark is held. Module information held includes the name and the maximum number of students allowed. For each module, the name and email address of the lecturers are held and details of their school name and the administration contact email for the school.

16. BITS Pilani, Dubai Campus is interested in developing an Internet Based Examination Results Enquiry System. This system will help all its authorized students to know their Grades in all the courses in which they have appeared for the current examination and current CGPA. The system will also help them to see at any point of time, the grades in all courses in previous examinations and also the CGPA obtained by the students at the end of every Semester. For simplicity, consider only the WEB ADMINISTRATOR and STUDENT as main people who are going to manage/use the system.

As a innovative Software Engineer, you are required to perform the following software design steps:

- a) Program Structure (Hierarchy Diagram) [4]
- b) Procedural Design using PDL [i.e. pseudocode/algorithm] [6].

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Comprehensive Examination Marking / Answering Scheme

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Date: 22/05/2005 Sunday Time: 10 a.m.- 1 Noon Total marks: 60

Weightage: 40% Data provided are complete. *Closed Book.*

Part A Answer all Questions. 10 * 2 = 20 Marks

1. What are the characteristics of Engineering and Scientific Software? Mention any two applications in this category?
Number Crunching Algorithms. CAD/System Simulation/Astronomy.
2. Information Structure: internal organization of various data/control items.
3. Control Coupling: A variable that controls decisions in a subordinate/superordinate module.
4. UI: user,task,environment analysis&modeling UI design construction
Validation
5. Inc. Model: Base System, Additional features added one by one. Modular way.
6. Reeng Tool: source code as input . output: structured analysis/design model, where-used list, control flow graph.
7. sw safety: identification of hazards that will affect sw as well as complete system.
8. $SMI = [Mt - [Fa + Fc + Fd]] / Mt$.
9. correct diagram for while if 1+1
10. Project Scheduling/Tracking. Tasks, Milestones, schedule. 1+1

Part B Answer all Questions. 4 * 5 = 20 Marks

11. Compute the **Count** for each of the **measurement parameter**

Ans. 40 80 120 80 40

3 marks for calculation involving ratio & measurement parameters
sum(Fj) 1 mark COUNT TOTAL: 1 Marks

12. SCI: 1.5 marks Configuration objects: 3.5 marks.
13. Debugging: Brute-Force, Backtracking, Cause-Elimination. 1+2+2
14. Decision Tree: 4 Paths 4*1 Mark. Final Answer: 1 Mark.

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Part C

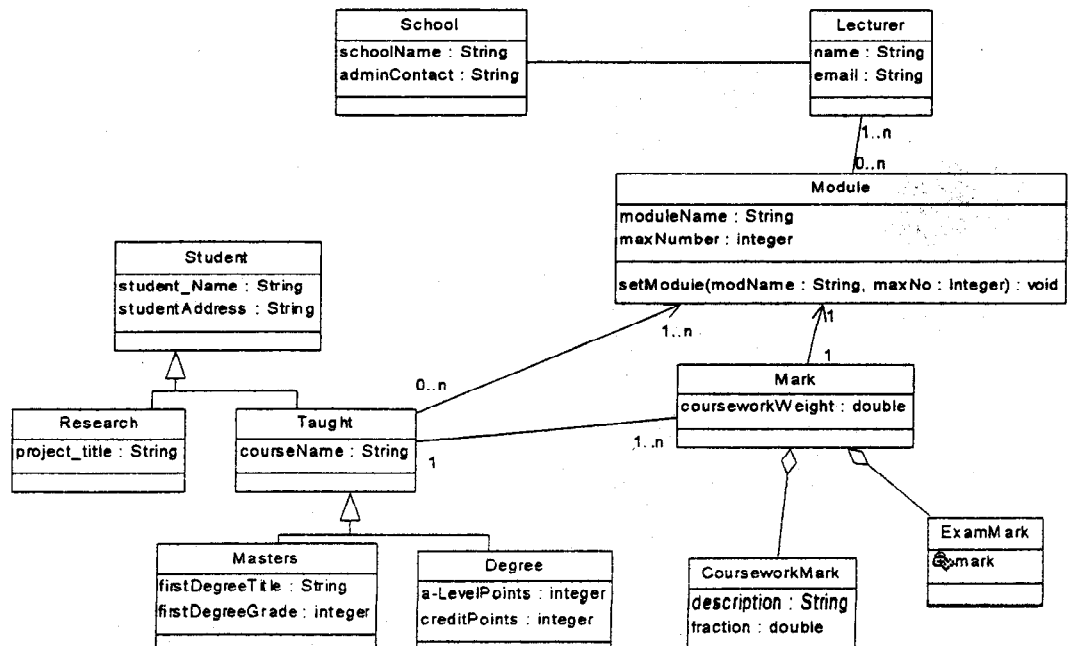
Answer all Questions.

2 * 10 = 20 Marks

16. Internet Based Examination Results Enquiry System a) Program Structure (Hierarchy Diagram) [4]

b) Procedural Design using PDL [i.e. pseudocode/algorithm] [6].

15. UML Class Diagram. classes, attributes, methods[6M] The inheritance relations / aggregation / composition [as applicable] [2M] and the associations [2M] must be included in the class diagram



BITS, Pilani – Dubai Campus, Knowledge Village, Dubai.
IV Year SECOND SEMESTER 2004-2005

Degree: B.E. (Hons.) Branch: C.S.E.

TEST I Question Paper

Course No : BITS UC461 Course Title: Software Engineering

Date: 27, FEB. 2005 Sunday Time: 9.30 a.m. - 10.20 a.m. Total marks: 20

Data provided are complete. Closed Book.

Answer all Questions.

1. Draw the **CONTEXT-LEVEL (LEVEL 0) DFD** and **LEVEL 1 DFD** for the following problem:

Joe's Yard

Joe's builders' suppliers, has a shop and a yard. His system is entirely manual. He has a stock list on the wall of his shop, complete with prices. When a builder wants to buy supplies, he goes into the shop and picks the stock items from the list. He writes his order on a duplicate docket and pays Joe, who stamps the docket as paid. The builder takes the duplicate docket and he goes to the yard and hands it to the yard foreman. The yard foreman gets the ordered items from the yard and gives them to the builder. The builder signs the duplicate docket and leaves one copy with the foreman and takes one copy as a receipt. Every week, Joe looks around the yard to see if any of his stock is running low. He rings up the relevant suppliers and reorders stock. He records the order in his order book, which is kept in the yard. The yard foreman takes delivery of the new stock and checks it against what has been ordered. He pays for it on delivery and staples the receipt into the order book. At the end of every month, Joe goes through all the dockets and the order book and produces a financial report for the shareholders.

As a creative software engineer, you are required to draw Level 0 and Level 1 data flow diagrams. [2+5 marks]

2. What is Embedded Software? Give an example application. [1+1 marks]
3. BPDC is interested in developing a new WEBSITE that can be accessed by any user across the world. It has formed 2 separate teams. Each team has 2 student members and a faculty member. It is proposed to complete the work in 90 days. Using RAD (Rapid Application Development) model, Write down the tasks pertaining to each phase, for this particular problem. [5 marks]
4. What are Exciting Requirements? Give an example. [2 marks]
5. What is an ESSENTIAL VIEW w.r.t. software requirements? [2 marks]
6. Identify the SOFTWARE TYPE, (i.e. category/area) for the following items:
a) Compiler b) Linker c) AUTOCAD d) CGI. [2 marks]

To

Course file

B. Vijayakumar

23/2/05

BITS, Pilani – Dubai Campus, Knowledge Village, Dubai.

IV Year SECOND SEMESTER 2004-2005

Degree: B.E. (Hons.) Branch: C.S.E.

TEST I Marking / Answering Scheme

Course No : BITS UC461 Course Title: Software Engineering

Date: 27, FEB. 2005 Sunday Time: 9.30 a.m. - 10.20 a.m. Total marks: 20

Data provided are complete. **Closed Book.**

Answer all Questions.

1. As a creative software engineer, **Draw the CONTEXT-LEVEL (LEVEL 0) DFD and LEVEL 1 DFD** for the Joe's Yard problem:
Level 0 DFD : entities on I/O, Labelled Data Flow 1+1
Level 1 DFD: Correct Sequence of Processes, Labelled Data Flow, Data Stores. [2.5+1.5+1]
2. embedded software: resides in PROM. Control products/systems for consumer/industrial markets. Key pad control in microwave oven. 1+1
3. RAD Model: tasks for each of the five phases (business modeling, data modeling, process modeling, application generation, testing & turnover) to be performed by 2 teams for website development project. $5 * 1 = 5$ marks.
4. Exciting Requirements: beyond customer's expectations and very useful.
Word processor with page layout, multiple printers & paper sizes, multilingual fonts. [1+1 m]
5. Essential view: functions to be accomplished, information to be processed, no details about implementation. [2m]
6. Identify the SOFTWARE TYPE, (i.e. category/area) for the following items:
a) Compiler b) Linker c) AUTOCAD d) CGI. [4*0.5=2 marks]
system sw, system sw, Engg&Scientific sw, web-based sw.

Course File

B. Vijayakumar

23/2/05

BITS, Pilani – Dubai Campus, Knowledge Village, Dubai.

IV Year SECOND SEMESTER 2004-2005

Degree: B.E. (Hons.) Branch: C.S.

TEST II Question Paper.

Course No : BITS UC461 Course Title: Software Engineering

Date: 10/04/ 2005 Sunday Time: 9.30-a.m. to 10:20 a.m. Total marks: 20

Data provided are complete. **OPEN Book.** 2 pages are there in qn paper.

Answer all Questions

1. Draw a **DECISION TABLE** for the following problem:

A marketing company wishes to construct a decision table to decide how to treat clients according to three characteristics:

Gender,

City Dweller,

and *age group*: A (under 30), B (between 30 and 60), C (over 60).

The company has four products (W, X, Y and Z) to test market.

Product W will appeal to female city dwellers. Product X will appeal to young females.

Product Y will appeal to Male middle aged shoppers who do not live in cities.

Product Z will appeal to all but not the older females.

[5 marks]

2. UML CLASS DIAGRAM

An employee has a name, address, phone number, date of birth and job title. Employees can be appointed and can leave, and are either monthly paid employees or weekly paid employees.

Monthly paid employees have a bank sort code and bank account number, while weekly paid employees are paid in cash on a specified day of the week - their payday. Weekly paid employees may be promoted to monthly paid.

All employees are entitled to use the Sports Centre if they register to do so. The Sports Centre is made up of two gyms, a swimming pool and a snacks bar.

The snacks bar can be booked for special events, and has three rates of hire - a working hours' rate, an evening rate and a weekend rate. The Sports Centre holds a list of employees who have registered.

[5 marks]

You are required to draw a UML class diagram for the above system.

3. SYSTEM IMAGE MODEL for AIRLINES INFORMATION SYSTEM

It is proposed to develop a system image model for a computer based AIRLINES INFORMATION SYSTEM for an International Airlines Authority. The Information system incorporates details such as FLIGHT SCHEDULE, SEAT AVAILABILITY, ARRIVAL & DEPARTURE, RESERVATION/CANCELLATION/STATUS ENQUIRY, FARES, CARGO RATES, TRAVELLER INFORMATION.

As an innovative Software Engineer, you are required to design a **System Image Model**.
[5 marks]

4. Answer the following questions with either TRUE or FALSE. [2 marks]

- a) Modular Decomposability reduces the complexity of the overall problem.
- b) Functional Independence can be achieved by increasing Coupling and reducing Cohesion.
- c) Within a DFD for a large system, a TRANSACTION FLOW alone is present.
- d) **Program Structure** represents procedural aspects of software.

5. UML SEQUENCE DIAGRAM for ON-LINE DEBIT-CARD PROCESSING SYSTEM

In a Shopping Centre, A shopper (could be yourself) gives the debit card number to the cashier, who sends the transaction information to the processing system, who communicates with the bank to make sure that there are sufficient funds in the account. The bank, of course, withdraws the funds for the purchase.

Draw a sequence diagram describing the interactions over time between the objects in the system.
[3 Marks]

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TEST II Marking Answering Scheme

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Date: 10/04/ 2005 Sunday Time: 9.30 a.m. - 10.20 a.m. Total marks: 20

Data provided are complete. **OPEN Book.**

Answer all Questions

1. Decision Table.

Correct values for

Conditions: 1.5 mks Actions: 1.5 mks Rules: 2 mks

Rules

Conditions	1	2	3	4	5	6	7	8	9	10	11	12
Gender	F	M	F	M	F	M	F	M	F	M	F	M
City	Y	Y	N	N	Y	Y	N	N	Y	Y	N	N
Age Group	A	A	A	A	B	B	B	B	C	C	C	C
Actions												
Market W	X				X				X			
Market X	X		X									
Market Y								X				
Market Z	X	X	X	X	X	X	X	X		X		X
Do not Market											X	

2. UML CLASS Diagram

classes, attributes. methods [3M] The inheritance relations / aggregation / composition [as applicable] [1M] and the associations [1M] must be included in the class diagram. [5 marks]

3. System Image Model for AIRLINES INFORMATION SYSTEM

Relevant Menus: 2 Screenshots: 2 Help, Error Assistance, Prompting, Tutor, Online Documentation / Manual: 1 [5 marks]

4. T F F F 4*0.5 marks

5. UML Sequence Diagram.

objects, messages, lifelines, activation 0.5, 1, 0.5, 1

[3 Marks]

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