BITS PILANI – DUBAI CAMPUS II Semester 2005 – 2006
IV Yr. C.S./EEE/EIE B.E. (Hons.)
Course: BITS UC461 SOFTWARE ENGINEERING
Individual Assignment: Total Marks: 40   Weightage: 10 %
Date for Record Submission: On or Before 29/03/06 Wednesday
Note: Delayed Subission will result in reduction in marks.
[-1 mark out of 10 per working day]
Copying not permissible and will not be considered. Issue Date: 07/03/06

Note: A Student should work **individually** and submit the assignment in a file folder.

ANALYSIS & DESIGN DOCUMENT for Computer Centre Activities

It is required to prepare the **analysis** and **design** document for managing the activities in a COMPUTER CENTRE.

The main activities to be considered are given below:

1. Maintain the Infrastructure, Devices, Network [Intranet & Internet facilities], Computer Systems.
2. Purchase of Computers through by Tenders from International Bidders.
3. Scheduling of Computer Labs. To UG/PG/Ph.D. students of Engineering disciplines
4. Online E-NoticeBoard System [all notices for courses, administration] for all users in the campus Local Area Network.
5. Conduction of Short Term Courses on Special topics [like PHP, ASP, ORACLE} to Registered Students and Delegates from industry.
6. E-Complaints Information System to get complaints from users and followup / attending to them.
7. Examination Results Enquiry System for students through Internet.

As a creative Software Engineer, You are required to perform the following functions:

- Draw Context Level [Level 0] DFD.   [3]
- Draw Level 1 DFD.   [6]
- Draw Level 2 DFD.   [9]
- Architectural Design   [4]
- User Interface Design   [9]
- Component Level Design [Pseudo Code or PDL]   [9]

(You must do the Analysis and Design related tasks, **innovatively** and systematically and in a **professional** way.)

BITS, Pilani – Dubai Campus, Knowledge Village, Dubai.
IV Year   Second Semester   2005-2006
Degree: B.E. (Hons.) Branch: C.S.
QUIZ [B]
Course No : BITS UC461 Course Title: Software Engineering
Date: 25/4/06 Tuesday   Time: 30 minutes   Total marks: 10   [16*0.5]+[2*1]
Weightage: 10%   Venue : Room 205   *Closed Book.*

IDNO: **Name:**

Write answers in the space provided in question paper. Answer all questions.

Note: _____ means one or more words to be filled within a line.

1. _____BOTTOM UP Integration_____ begins construction and testing

with atomic modules.

2. ECO stands for ___Engineering change order___

3. Cause Elimination is a category for ___Debugging___.

4. ___UNIT Testing___ focuses verification effort on the

smallest unit of software design.

5. In SCM, ___Version control___

   combines procedures and tools to   manage different versions of configuration
   objects that are created during software process.

6. An example for a structured construct in FLOW GRAPH NOTATION

   is ___sequence/if/while/until___

7. ___Condition Testing___ is a Test Case Design Method that

exercises the logical conditions contained in a program module.

8. ___Regression Testing___ is the Reexecution of some subsets

   of tests that have already been conducted to ensure that changes have not
   propagated unintended side effects.

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9. _Cyclomatic Complexity_ is a software metric that

provides a quantitative measure of the logical complexity of a program.

10. _Data Flow Testing_ selects test paths of a program

according to the locations of definitions and the uses of variables in a program.

11. What is a CASE REPOSITORY ? What are its functions?   1M

   — Developers Database
   — Stores Diagrams, specifications, code
   — ensures standardization, consistency.
   — tracks people, Data, Process, Network Technology.

12. In SCM, _Audit Trial_ establishes

additional information about when, why and by whom changes are made.

13. _Stub_ is a dummy subprogram that uses the subordinate

module's interface, do minimal data manipulation, prints verification of entry and return
control to the module undergoing testing.

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14._____Equivalence partitioning___is a black-box testing

method that divides the input domain of a program into classes of data from which test cases can be derived.

15. During _____Security Testing_____, the tester plays the role(s) of

the individual who desires to penetrate the system.

16. What   tasks/functions are provided by a CROSS LIFE CYCLE CASE TOOL?   1M

Project Management, Process Management, Estimation, Documentation.

17. A ___Variant___ is a different collection of objects at the

same Revision Level.

18.___Alpha Testing___ is conducted at developer's site by end users.

BITS, Pilani – Dubai Campus, Knowledge Village, Dubai.
IV Year   Second Semester   2005-2006
Degree: B.E.(Hons.).   Branch: C.S./ EIE
Comprehensive Examination Question Paper
Course No : BITS UC461   Course Title: Software Engineering
Date: 31/05/2006 Wednesday   Time: 3 hours   Total marks: 60
Weightage: 40% Data provided are complete. *Closed Book*.
There are 4 pages in question paper.

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

1. What is the need for ubiquitous computing ?
2. When will you prefer INCREMENTAL MODEL for software development?
3. What is an EXCITING REQUIREMENT? Give an example.
4. How will you achieve Functional Independence in Design?
5. Why is software architecture very important and essential ?
6. What are the possible OUTCOMES of DEBUGGING?
7. Define the following terms w.r.t. Data Flow Testing:
    a) DEF(S)   b) USE(S)
8. What is a baseline in Software Configuration Management?
9. Distinguish between *software reliability* and *software safety*.
10. List the contents of a CASE REPOSITORY. Where is the CASE REPOSITORY
    stored?

Part B   Answer **all** Questions.

11. DATA FLOW DIAGRAMS for *AIRLINES INFORMATION SYSTEM*

It is proposed to develop 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 a creative and innovative Software Engineer, You are required to perform the
following functions:
-   Draw Context Level [Level 0] DFD.   [2]

-   Draw Level 1 DFD.   [3]

-   Draw Level 2 DFD.   [5]

12. **DECISION TREE** to support the Make / Buy Decision

a) 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*.
You are provided with the following data related to the above four cases:

i) *BUILD*

Development Effort	Probability	Estimated Cost
SIMPLE	30%	$280K
DIFFICULT	70%	$350K

(Note: 1K = 1000)

ii) *REUSE*

Development Effort	Probability	Estimated Cost
MINOR CHANGES	35%	$200K
MAJOR CHANGES	65%	$490K

iii) *BUY*

Development Effort	Probability	Estimated Cost
MINOR CHANGES	40%	$350K
MAJOR CHANGES	60%	$520K

iv) *CONTRACT*

Development Effort	Probability	Estimated Cost
WITHOUT CHANGES	55%	$350K
WITH CHANGES	45%	$500K

b) **Which one** of the options [paths] gives the **Lowest Expected Cost ?**   4+1=5 Marks

13. UML SEQUENCE DIAGRAM for WEATHER MAPPING SYSTEM

A weather mapping system is required to generate weather maps on a regular basis using data collected from remote, unattended weather stations and other data sources such as *weather observers, balloons and satellites*. Weather stations transmit their data to the area computer in response to a request from that machine.
The area computer system validates the collected data and integrates the data from different sources. The integrated data is archived and using data from this archive and a digitized map database, a set of local weather maps is created. Maps may be printed for distribution a special-purpose map printer or may be displayed in a number of different formats.
Draw a sequence diagram describing the interactions over time between the objects in the above system.   [5 marks]

14. UML CLASS DIAGRAM for CAMPUS PLACEMENT SYSTEM

BITS Pilani, Dubai Campus is interested in developing a computer based information system for managing CAMPUS PLACEMENT related activities for final year students.

The main *Entities* and their activities include the following:

PLACEMENT ADMINISTRATOR: Maintain *Course, Student* and *Company* details. Plan Schedules for Interviews/Written Tests/Group Discussions, Correspondences with *Companies* and *Students*.

STUDENTS: Inquire/Print/SUBMIT/Modify Resume. Students correspond with Placement Administrator and Companies regarding Acceptance of job offer and any other enquiries related to placement.

COMPANY conducts written Tests, Group Discussions, shortlists students for final interview and interacts with Placement Coordinator & Students regarding selection list, TERMS and Conditions and Briefing.

As an innovative software engineer, draw an UML CLASS DIAGRAM for the above system.   [5 marks]

15. Develop a Procedural Design [using **PDL** or **Pseudocode**] for the following problem: [5 marks]

Generation and Summation of a given series.

Generate and print the sum of the following series:

SUM = 1 - 2 - 3 + 4 + 5 + 6   - 7 - 8 - 9 - 10 + ... N th term
        (i.e one plus term, 2 minus terms, 3 plus   terms,   4 minus terms,
            Five plus terms,   six minus terms   and so on till N th term).

Test Case / Sample Session:

Input: N=10
Output: SUM= -23

Input: N=7
Output: SUM= 4

16. Explain the METRICS for *Source Code* and the METRICS for *Maintenance*.
                                                                                    [6 marks]

17. Draw The GANTT (TIMELINE) CHART for the following Project Data:
(You can define your own scale; you may use 2 consecutive pages in answer booklet and draw freely OR YOU CAN USE GRAPH SHEET)

TASK	START DATE	END DATE
T1	07 JAN 06	08 JAN 06
T2	08 JAN 06	11 JAN 06
T3	12 JAN 06	13 JAN 06
T4	14 JAN 06	18 JAN 06
T5	19 JAN 06	21 JAN 06
T6	19 JAN 06	21 JAN 06
T7	20 JAN 06	22 JAN 06
T8	20 JAN 06	28 JAN 06
T9	29 JAN 06	08 FEB 06
T10	14 JAN 06	12 FEB 06

MILESTONE	DATE
M1	21 JAN 06
M2	28 JAN 06
M3	08 FEB 06

[4 marks]

BITS, Pilani – Dubai Campus, Knowledge Village, Dubai.
IV Year   SECOND SEMESTER   2005-2006
Degree: B.E. (Hons.)   Branch: C.S.E./E.E.E./E.I.E.
TEST II Question Paper
Course No : BITS UC461   Course Title: Software Engineering
Date: 09, April 2006 Sunday   Time: 8.30- 9.20 a.m.   Total marks: 20
Data provided are complete. OPEN *Book*.

Answer all Questions.

1. **UML SEQUENCE DIAGRAM for AUTOMATED OPERATION in a PETROL STATION**

.A petrol station is to be set up for fully automated operation. Drivers swipe their credit card through a reader connected to the pump; the card is verified by communication with a credit company computer & a fuel limit is established. The driver may then take the fuel required. When fuel delivery is complete and the pump hose is returned to its holster, the driver's credit card account is debited with the cost of the fuel taken. The credit card is returned after debiting. If the card is invalid, the pump returns it before fuel is dispensed.

Draw a sequence diagram describing the interactions over time between the objects in the above system.   [6 marks]

2. BITS Pilani, Dubai Campus is interested in developing a computer/web based information system for managing GRADING activities. The different kinds of authorized users and their activities include the following:

GRADING ADMINISTRATOR: Print Grade Cards and Transcripts, Maintain Course, Student and Faculty details.

STUDENTS: Inquire/Print Current Examination Result.

FACULTY MEMBERS: For every course handled by them, Maintain details about evaluation components, Print Histograms, Finalize Grades.

As a Creative Software Engineer, you are required to perform the following software design steps:
a) Program Structure (Architectural Design)   [2 marks]
b) System Image Model (UI Design)   [4 marks]

p.t.o.

3. Develop a Procedural Design [using **PDL** or **Pseudocode**] for the following problem: [6 marks]

Is it A Runaround Number?

An *N*-digit [assume N =2 or 3 or 4 or 5 or 6 or 7] runaround number is characterized as follows:

- It is an integer with exactly *N* digits, each of which is between 1 and 9, inclusively.
- The digits form a sequence with each digit telling where the next digit in the sequence occurs. This is done by counting the number of digits to the right of the current digit. If necessary, counting wraps around from the rightmost digit back to the leftmost.
- The leftmost digit in the number is the first digit in the sequence, and the sequence must return to this digit after all digits in the number have been used <u>exactly once</u>.

You need to write **PDL** or **pseudocode only**. The example below will help you to understand the problem in an easier way.

Sample Input

```
13
137
1234
83491
```

Sample Output

```
Case 1: 13 is runaround number
Case 2: 137 is not runaround number
Case 3: 1234 is not runaround number
Case 4: 83491 is runaround number
```

4. Give an example application for each of the following categories:
    a) HIGH COHESION   b) HIGH COUPLING   [2 marks]

BITS, Pilani – Dubai Campus, Knowledge Village, Dubai
IV Year – SECOND SEMESTER 2005-2006
Degree: B.E. (Hons.) Branch: C.S.E./E.E.E./E.I.E.
TEST I Question Paper
Course No : BITS UC461   Course Title: Software Engineering

Date: 22/02/06 Wednesday   Time: 50 minutes   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:

Warehouse

A company makes complicated engineering structures. To operate, the company keeps a large warehouse of parts.

Typically, an internal order for parts is made by the manufacturing division. From these orders a picking list is made and the parts are picked from bins. The quantity in the bins is amended on a notice at each bin. Also, the amended quantity is compared with a reorder level. If the quantity of parts is below this reorder level, then a requisition is made and sent to the purchasing department to order more parts. In this way the quantity of parts is maintained at an acceptable level. Nevertheless, it is possible that an order is only partly filled. An issue notice is sent to the Accounts department so that a record of cost is maintained.

When a part is delivered from the supplier, the goods are checked with the delivery note and the warehouse staff place the parts in their bins and amend the quantities on the bin notices. Discrepancies with the delivery note are dealt with at this time. Outstanding internal orders are then examined to see if they can now be met.

As a creative software engineer, you are required to draw Level 0 and Level 1 data flow diagrams.   [1.5+4.5 marks]

2. Consider the following interactive application:

"An INTERNET based EXAMINATION RESULTS ENQUIRY SYSTEM for an UNIVERSITY, ". The above software is managed by Database Administrator and relevant functions/operations can be accessible by authorized students.

As an innovative software engineer, you are required to **define** a set of *overall requirements* for developing software for the above application, using Waterfall Model.   4 marks.

3. Explain the different CMMI [Capability Maturity Model Integration] levels prescribed by Software Engineering Institute (SEI).   5 Marks.

4. Define a) Product-Line Software. Mention 2 example applications.
        b) Artificial Intelligence Software. Mention 2 example applications. [2+2 marks]

5. Why can't we find all errors before we give the software to our customers?
[1 mark]