2010-2011
II SEMESTER M.TECH. EXAMINATION
(COMPUTER ENGINEERING)
SOFTWARE ENGINEERING – II (CO-603)

Maximum Marks: 75

Duration: Three Hours

Attempt all questions
Assume suitable data wherever necessary.

1. (a) What are the attributes of effective software metrics? Write the algorithm for computation of Bang Metrics for data strong applications.
(b) A module has 5 input and 4 output data parameters, 2 control parameters, accesses 6 items of global data and has a fan-in of 4 and fan-out of 3. Determine its coupling.

OR

1'.(a) Give the empirical equation of software quality factor in terms of the metrics proposed by McCall. Also list and briefly explain the metrics used in the grading scheme for measurement of quality factor.
(b) Define the following metrics related to analysis model and software design:
   i) Specificity
   ii) Henry & Kafura's complexity metric
   iii) Structural complexity
   iv) Data complexity

2. (a) What is a software risk? Distinguish between the Project risk and Technical risks. Also give a method for identification and management of software risks.
(b) A software project involving 10 software engineers is under the threat of the following risks:
   i) Only 40% of the initially planned 80 components would be reused. The average size of each component is 20 KLOC and the risk probability is 75%.
   ii) There is a risk probability of 60% that 20% of the staff may leave the project midway. Training and recruitment cost is around Rs. 80,000.00 per engineer.
   iii) The size of software is wrongly estimated to be 200 KLOC less than the actual software. The risk probability is 80% and the cost per KLOC is Rs.1000.00.

Determine the overall Risk Exposure to the software project.
3. (a) What do you understand by Software Configuration Management (SCM)? Define Baseline and SCIs.
(b) Develop a flow chart to demonstrate how change control is brought about in a software project.

4. (a) Enumerate the various cost factors involved in the pursuit of software quality.
(b) Give the Japanese concept of Total Quality Management (TQM)? Briefly describe each step involved therein with reference to software development.
(b') Write the objectives and guidelines for Formal Technical Review (FTR).

OR

5. (a) Define software reliability and explain its measurement.
(b) How is Software Re-engineering different from maintenance? What are the major phases in the Re-engineering Process Model? Also explain Reverse Engineering.
(b') Write a short note on ISO 9000 software quality standards. List and describe ISO 9126 quality factors as well.
2010 – 2011
M.TECH. (II SEMESTER) EXAMINATION
(COMPUTER ENGINEERING)
OBJECT ORIENTED ANALYSIS AND DESIGN
(CO – 604)

Maximum Marks : 75
Duration : Three Hours

Note: Answer any Five questions.

1.(a) Construct object model based on following information —

At railway station, one or more reservation counters exist. A queue exists against each counter. Persons in a queue are serviced in order.

(b) Give an example of ternary association.

(c) Take an example to show the problem that would arise if link attributes are folded into the class.

2.(a) Construct event trace diagram for the operation-money withdrawal from ATM.

(b) What is an abstract class? What are its applications? Give some realistic example of this.

(c) Construct object model for the file system in a computer.

3.(a) Construct object model based on following information —

A university assigns unique enrolment number to each of its students. A student may be enrolled in more than one university.

(b) What are derived object and derived links? Take some suitable example to explain.

(c) Describe the information that is put in specification of a state or in characterization of a state.

4.(a) Construct state diagram choosing functionality of a digital clock. Clock displays only hours and minutes. Clock has buttons for setting time and alarm. Make suitable assumption wherever needed.

(b) What is automatic transition? Explain.

(c) How is functional model structured if it is large and complex.

5.(a) Construct object model based on following information —

Water tank is fitted with a system that produces alarm when the tank is full or empty. Distinct alarms are used for two conditions. The two conditions are detected by using two sensors.

(b) Differentiate between one shot life cycle and continuous loop kind state diagram. Give a realistic example of each.

(c) Give a realistic example of following —

* Generalization being applied to events.

* Generalization being applied to actors in use case diagram.
6.(a) List various diagrams supported by UML. Write in brief about each.

(b) Construct object model based on following information —

In software development process, review committees are used to review into intermediate products/items. Review committee is chaired by author of the item. It also contains two experts and project manager.

(c) What is multiple inheritance? Explain.

7.(a) Construct use case diagram showing services of engineering college library.

(b) Describe as to how object and classes can be obtained from problem statement.

(c) Give a realistic example of following —

* Generalization restricting super class.

* Generalization being done for optimization.
2010-2011
M. TECH. (II SEMESTER) EXAMINATION
(COMPUTER ENGINEERING)
ADVANCED COMPUTER NETWORKS
(CO-611)

Maximum Marks: 75

Duration: Three Hours.

1. Assume a suitable data, if not given.
2. Acronyms have their usual meanings.

Q1 (a) What are the characteristics of wireless links? With the help of suitable diagrams, discuss hidden terminal problem and fading. 5

(b) Describe 802.15 used in Wireless Personal Area Networks (WPAN). Draw a diagram showing an 802.15 piconet. 4

(c) What are the impacts of wireless nature of links and the mobility, on higher layer protocols, for example, TCP and UDP? Describe the approaches to deal with the problems arising due to TCP’s congestion control response in a wireless setting. 6

OR

1’ (a) What is meant by a handoff in GSM? With the help of suitable diagrams, describe the steps involved when a base station does decide to handoff a mobile user. What happens when the mobile moves to a base station (BS) that is associated with a different MSC than the old BS, and what happens when this inter-MSC handoff occurs more than once? 7

(b) (i) Consider Code-Division Multiple Access (CDMA) for a single sender who is assigned an M-bit code (1, -1, 1, -1, 1, 1, -1, -1), where M=8. Assume that there are two data bits \( d_0 = -1, d_1 = 1 \) to be sent in time slots 0 and time slot 1, respectively. Sketch the channel output at the sender side as well as at the receiver side.

(ii) Now consider that there are two sender-receiver pairs: (S1, R1) and (S2, R2). The first pair is allocated a code (1, 1, 1, -1, 1, -1, -1, -1), and the second pair is allocated a code (1, -1, 1, 1, 1, -1, 1, 1). Sketch the channel outputs at the sender side and at the receiver side. Write all intermediate steps and expressions used. 8

Q2 (a) With the help of a suitable diagram describe 802.11 architecture. What are the frequency ranges and data rates of 802.11a, 802.11b, and 802.11g standards? 4
(b) Describe 802.11 MAC protocol. Why collision detection is not implemented in case of 802.11? How can one avoid collisions in the presence of hidden terminals in case of 802.11? Explain with the help of suitable diagrams.

(c) Suppose there are two ISPs providing Wi-Fi access in a particular café, with each ISP operating its own AP and having its own IP address block.
   (i) Further suppose that by accident, each ISP has configured its AP to operate over channel 11. Will the 802.11 protocol completely breakdown in this situation? Discuss what happens when two stations, each associated with a different ISP, attempt to transmit at the same time.
   (ii) Now suppose that one AP operates over channel 1 and other over channel 11.

Q3 (a) What are the elements of mobile network architecture? With the help of suitable diagrams, describe in detail the indirect and direct routing to a mobile node.

(b) Consider an indirect routing from a correspondent to a mobile user. Suppose that the correspondent is also mobile. Sketch the network layer infrastructure that would be needed to route the datagram from the correspondent to the mobile user, and from the mobile user to the now mobile correspondent. Use indirect routing.

OR

3’ (a) Describe agent discovery, registration with the home agent, and indirect routing of datagrams in case of Mobile IP.

(b) Consider two mobile nodes in a foreign network having a foreign agent. Is it possible for the two mobile nodes to use the same care-of-address in Mobile IP? Explain your answer.

(c) In Mobile IP, what effect will mobility have on end-to-end delays of datagrams between the source and destination?

Q4 (a) How jitter can be removed at the receiver for audio? Describe two playout strategies: fixed playout delay, and adaptive playout delay.

(b) With the help of an appropriate diagram, describe setting up a call to a known IP address in case of Session Initiation Protocol (SIP). With the help of a suitable example, describe how name translation is carried out for a voice-over-IP session using SIP.

(c) Describe Content Distribution Networks (CDNs). How a CDN company determines the “best” CDN server for the requesting host.
4' (a) Consider two *forward error correction* (FEC) schemes for Internet phone. The first scheme sends a redundant encoded chunk after every $n$ chunks. The second scheme sends a lower resolution audio stream as the redundant information. Suppose the first scheme generates a redundant chunk for every four original chunks. Suppose the second scheme uses a low-bit rate encoding whose transmission rate is 25% of the transmission rate of the nominal stream.

(i) How much additional bandwidth does each scheme require? How much playback delay does each scheme add?

(ii) How do the two schemes perform if the first packet is lost in every group of five packets? Which scheme will have better audio quality?

(iii) How do the two schemes perform if the first packet is lost in every group of two packets? Which scheme will have better audio quality?

(b) Consider an Internet phone application where the speaker generates an audio signal consisting of alternating talk spurts and silent periods. In order to conserve bandwidth, the Internet phone application generates packets only during talk spurts. During a talk spurt the sender generates bytes at a rate of 8000 bytes per second, and every 20 milli-seconds the sender gathers bytes into chunks. Let $h$ be the total number of header bytes added to each chunk, including UDP and IP headers.

(i) Assuming an IP datagram is emitted every 20 milli-seconds, find the transmission rate in bits per second for the datagrams generated by one side of this application.

(ii) What is a typical value of $h$ when RTP is used? What portion of the bandwidth is consumed by the header part when RTP is used?

(c) Consider the adaptive playout delay scheme to estimate the network delays. Let $d_i$ be an estimate of the average network delay upon reception of the $i$th packet, which is governed by the following expression.

$$d_i = (1-u)d_{i-1} + u(r_i - t_i)$$

where, $t_i$ is the timestamp of the $i$th packet (i.e. the time the packet was generated by the sender), $r_i$ is the time packet $i$ is received by the receiver, and $p_i$ is the time the packet is played at the receiver. Suppose that $u = 0.1$. Let $r_1 - t_1$ be the most recent sample delay, let $r_2 - t_2$ be the next most recent sample delay, and so on.

(i) For a given audio application, suppose four packets have arrived at the receiver with sample delays $r_4 - t_4$, $r_3 - t_3$, $r_2 - t_2$, and $r_1 - t_1$. Express the estimate of the delay $d$ in terms of the four samples.

(ii) Generalize your formula for the $n$ sample delays.
Q5 (a) With the help of a suitable diagram, describe Weighted Fair Queuing (WFQ). How does WFQ differ from round robin scheduling?

(b) What do you understand by policing? What are the parameters used for policing? Discuss how one can combine leaky bucket with weighted fair queuing for provable maximum delay in a queue.

(c) Describe the key features of Intserv architecture. What are the difficulties associated with the Intserv model? How these difficulties are addressed in case of Different model.
2010-2011
M. Tech. 2nd Semester Examination
(Computer Science and Engineering)
DIGITAL SYSTEM DESIGN (CO-623)

Maximum Marks: 75
Duration: Three Hours

- Attempt All questions.
- Symbols and notation used have their standard meanings.
- Assume suitable data if required.

1(a) Explain the clock skew, signal skew and their effects on the operation of a digital system.
(b) What are the different CAD tools used in the design of a digital system?
(c) How the maximum frequency of the digital system is determined?

OR

1'(a) What is state assignment? Explain the guidelines used for determining state codes
(b) What is the cause of ‘Metastability’ in a sequential system and how it can be removed?
(c) What are the different design entry tools used in the design?

2(a) Design a 2-bit sequential adder, with minimum number of states (outputs are SUM and CARRYOUT)
(b) Design a sequence detector with a single input line “X” and single output line ”Z”,
which has the input and out pattern as “0110101110” and “00001010000” respectively.

OR

(b') Generate the state diagram of a 3-bit down counter that counts the odd number only in a cyclic order, with minimum numbers of states, and give suitable codes to the states.
(c) Name different VHDL modeling style of a system.

3(a) Design a sequence detector that detect sequence “1010” or “1110” and give an active high output, such that the output is valid just before the active edge of the clock pulse.
(b) Describe any two predefined signal attribute and vector attributes used in VHDL.
(c) How the interface signals of a module is listed in VHDL? Describe its parts.

4(a) Write a VHDL function that accept three binary numbers and return their sum.

OR

(a') Give VHDL model for an asynchronous and synchronous resetting JK flip-flop using Block statements
(b) Differentiate between ‘Transport Delay’ and ‘Inertial Delay’. How the pulse rejection limit is made different from propagation delay in VHDL codes
(c) Write the assertion statements to check for timing violation in the VHDL codes for D Flip-Flop

5(a) Write the Verilog codes for a five bit parity checker
(b) Write down the VHDL codes for the sequential system whose state diagram is given in figure (1). Use algorithmic modeling style.

\[ \text{Figure (1)} \]

\begin{center}
\begin{tikzpicture}[node distance={25mm}, thick, main/.style = {draw, circle}]
    \node[main] (1) {S0};
    \node[main] (2) [right of=1] {S1};
    \path[->] (1) edge node[above] {00/0} (2)
              edge [loop above] node {10, 01/1} (1)
        (2) edge [loop below] node {00/1} (2)
              edge [bend right] node {11/0} (1)
              edge node[above] {11/1} (1);
\end{tikzpicture}
\end{center}

(b') Explain the function of digital system described by the VHDL code given below.

```vhdl
entity PROB is
  port (A : in integer range 0 to 3;
       Z : out bit_vector (3 downto 0));
end PROB;

architecture FUNCTION1 of PROB is
begin
  process (A)
  begin
    Z <= "0000;"
    for I in 0 to 3 loop
      if (A = I) then
        Z(I) <= '1';
        end if;
    end loop;
  end process;
end FUNCTION1;
```

(c) How a two dimensional array `ARRAYI` of 5 rows and 4 column consisting of 3-bit vector is declared in VHDL.