Computer Engineering Department, S V N I T, Surat.
Endsemester Examinations, November 2017
B.Tech-IV (CO) – Seventh Semester
Course: CO401 – Software Engineering
Time: 15:30 to 18:30

e: 27th November 2017

ructions:
Write your B.Tech. Admission No/Roll No and other details clearly on the answer books while write your B.Tech. Admission No on the question paper, too. Max Marks: 100
Assume any necessary data but give proper justifications.
Be precise and clear in answering the questions.

1 **Answer the following: (Any Eight)** [40]
Explain why it is particularly important to define sub-system interfaces in a precise way and why algebraic specification is particularly appropriate for sub-system interface specification.
2) You are a system engineer and asked to suggest the best way to develop the safety-critical software for a heart pacemaker. You suggest formally specifying the system, but your manager rejects your suggestion. You think his reasons are weak and based on prejudice. Is it ethical to develop the system using methods that you think are inadequate? Justify your answer with suitable arguments.
Explain why it is not necessary for a program to be completely free of defects before it is delivered to its customers. To what extent a testing be used to validate that the program is fit for its purpose?
4) What is the difference between ontology and Object Oriented class structure? Enlist operations on ontology.
5) Explain the problem of ambiguity in requirement specification. Explain semantic ambiguity with example.
Give logic specification for a program that computes the integer square root of nonnegative integers.
A major requirement of a classical producer-consumer system in that, at any time, the sequence of items produced by the producer (passed to operation WRITE as parameters) coincide with the sequence of items consumed (i.e. obtained through GET); except for the most recently produced elements, which are kept in buffer. This property must always hold.
Specify the above requirement using logic specification.
8) Give an alternative specification for lighting up a button by using Petri Nets augmented with priorities, instead of timed PNs.
9) Explain with suitable example functional decomposition and balancing in Data Flow Diagram.

Q.2 **Answer the following:** [20]
1) A large pizza business makes pizzas and sells them. The pizzas are manufactured and kept in cold storage for not more than two weeks. The business is split into a number of functional units. There is Production Control, Manufacturing, Stores, Accounts, Sales, Shipping and Purchasing. Production Control are responsible for organizing which pizzas to produce in what order and in what quantity. They need to schedule the production of the pizzas according to the current and expected sales orders together with the number of pizzas already in stores. Manufacturing take the raw materials from the stores and manufacture pizzas returning the completed goods to the stores. Accounts deal with the payments for the pizzas when delivered to the customer and the payment to the suppliers of the raw materials. Sales deal with customer orders whilst Purchasing organize the buying of raw material from suppliers. Shipping manages the packing and delivery of the goods to the customer with a delivery note.
When a sales order is received by sales they record what is being ordered and by whom. They also record the details of the expected date of delivery. Production Control access this information and make sure that, if required, pizzas are produced by Manufacturing and are ready in stores for when the delivery needs to be made.
After the delivery is made Accounts make sure that the customer receives an invoice and that payment for the invoice is received at which time a receipt is issued. Purchasing look at the current stock of raw materials and by using current stock levels, supplier turnaround times and quantity to be ordered decide what needs to be ordered on a daily basis. Their aim is never to run out of an ingredient but to minimize the amount of raw material kept in stock.
Draw a context level, level-1 and level-2 Data Flow diagrams for the above software requirements.
2) Formalize the requirements of an Elevator system discussed in class using logic specification. Clearly explain all the predicates you have assumed for explaining the rules that govern the movement of the elevator. (Formalize any five rules of your choice)

Q.3(A) **Answer the following:** [20]
1) Identify the functional and nonfunctional requirements for the following:
Consider the application scenario of e-democracy and online voting. Many people consider that the Internet could replace representative democracy and enable everyone to vote on anything by online voting. Online voting can reduce cost and make voting more convenient. This type of voting can be done for e-democracy or it may be used for finalizing a solution, if many alternatives are present. Online voting makes use of authentication, hence it needs security. The system must be able to address obtaining, marking, delivering, and counting ballots via computers. Advantage of online voting is that it can increase voter turnout because of convenience and can help to reduce fraud voting.

2) A software application has 10 Low External Inputs, 12 High External Outputs, 20 Low Internal Logical Files, 15 High External Interface Files, 12 Average External Inquiries, and a value adjustment factor of 1.10. Answer the following with respect to the above software:
a) What is the unadjusted function point count (i.e. count value)?
b) What is the adjusted function point count (i.e. functional Point)?

3) Following is the code for GCD computation by Euclid's method:

```
while (x != y) {
    if (x > y)
        x = x - y;
    else
        y = y - x;
}
return x;
```

a) Draw the Control Flow Graf for the above code.
b) Find the cyclomatic complexity for the same and find the independent paths.

4) Given the problem statement, "determine the class average for a set of test grades, input by the user. The number of test grades is not known in advance (so the user will have to enter a special code -- a "sentinel" value -- to indicate that he/she is finished typing in grades)".
Do the Stepwise Refinement of the above problem statement.

Q.3(B) Do as directed:

1) A web browser is software that helps to access a resource (web page) available on the World Wide Web and identified by a URL. Whenever a user types in the URL of a web page in the browser's address bar and clicks the "Go" button, the browser sends a HTTP request to the concerned web server. If the requested resource is available and accessible, the web server sends back a HTTP response to the requesting web browser. In case of any error, a HTTP response is sent indicating the error.
When the web browser receives a HTTP response, it displays the web page to the user. In very simple terms a web browser can be thought of consisting of the following sub-components: rendering engine, and browser control.
Once a HTTP response has been obtained from the server, the rendering engine decides the layout of the contents and actually displays the requested page. This is done keeping in mind the different HTML elements that are present in the page, and corresponding CSS rules, if any.
The browser control provides facilities like navigating across pages (by following hyperlinks), reload a page, and handles other events related to the window display, for example, resizing the browser window.
(i) Make a simplified Class Diagram for the web browser
(ii) Make the Sequence Diagram for the web browser

2) Explain in brief:
(i) Static testing vs Dynamic Testing
(ii) Scope of the Case tools

3) "Testing and correctness proof are not quite comparable, and the key issues are other things: inference and judgment. Development needs both. Perhaps ideally fused into 'inferential construction'".
Justify the above statement with suitable arguments.

OR

3) Create the equivalence classes for the following:
(i) In a system designed to work out the tax to be paid has the following requirements:
An employee has £4000 of salary tax-free. The next £1500 is taxed at 10%. The next £28000 after that is taxed at 22%. Any further amount is taxed at 40%.
(ii) One of the fields on a form contains a text box which accepts alphanumeric values.