Roll Number:

Thapar Institute of Engineering and Technology, Patiala
Computer Science & Engineering Department

BE CSE Second Year **Course Code: UCS503**
EST- May 13, 2024 **Course Name: Software Engineering**
Time: 3 Hours; MM: 40 **Instructors: Dr. Ashima Singh, Dr. Himika & Dr. Shruti Aggarwal**

Note: Attempt ANY FOUR Questions

Ques	Questions	Marks	CO	BL
Q1	What is the difference between composition and inheritance, and when would you prefer one over the other in designing object-oriented systems? How does inheritance facilitate code reuse in object-oriented programming, and what are the potential drawbacks of excessive inheritance? How does the number of modules affect the cost of development and cost of integration? Explain with the help of a suitable diagram. List different faults in at least four fault classes that can be identified in static analysis checks.	10	CO1	L2
Q2a **2b.**	Draw the State Chart diagram for the given scenario. The vending machine has four states namely: "Idle," "Coin Inserted," "Dispensing," and "Item Sold." The state machine starts in the "Idle" state, representing the initial state of the vending machine when no actions have been taken. When a coin is inserted, the event triggers a transition to the "Coin Inserted" state. From the "Coin Inserted" state, there are two possible events: if the user cancels the transaction, the machine returns to the "Idle" state; if the user selects a product, the machine transitions to the "Dispensing" state. In the "Dispensing" state, the vending machine dispenses the selected item. Once the item is dispensed, the "Item Sold" state is reached. From the "Item Sold" state, the machine can either return to the "Idle" state if no further actions are taken, or it can transition to the "Coin Inserted" state if the user inserts additional coins for another purchase. Design a Sequence Diagram for the process of booking a flight ticket through an online booking system. Consider interactions between the customer, booking system, payment gateway, and airline reservation system. Clearly illustrate the sequence of events and interactions/ messaging between different actors in flow objects and components involved in the booking process	10	CO3	L4

<table>
<tr>
<td>Q3a

Q3b</td>
<td>A software development project is estimated to have 20000000 lines of code. The project is classified as a semi-detached project with a moderately experienced development team. The project schedule is not very tight. Calculate the effort, and development time using the COCOMO model.

Consider the following Precedence Table for the optimal scheduling of tasks. Task A: UI Design, Task B: Backend Development, Task C: Database Setup, Task D: API Integration, Task E: User Authentication Module, Task F: Expense Tracking Feature, Task G: Graphical Reports Module, Task H: Notifications Integration
<table>
<tr><td>Activity</td><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td><td>F</td><td>G</td><td>H</td></tr>
<tr><td>Immediate Predecessor</td><td>-</td><td>-</td><td>A</td><td>B</td><td>C</td><td>D,E</td><td>F</td><td>F</td></tr>
<tr><td>Expected Time (days)</td><td>15</td><td>20</td><td>10</td><td>25</td><td>15</td><td>30</td><td>20</td><td>15</td></tr>
</table>
i). Prepare an Activity-On-Arc Network Diagram. Legend to be used for AOA.
<table>
<tr><td>Early Start</td><td>Early Finish</td><td rowspan="2">Slack/Delay</td></tr>
<tr><td>Late Start</td><td>Late Finish</td></tr>
</table>
ii). Calculate Early Start, Early Finish, Late Start, Late Finish, and Slack for each activity. (Give in Table)
iii). Give Critical Time, Critical Path quoting the Critical Activities</td>
<td>10</td>
<td>CO2</td>
<td>L3</td>
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<td>Q4a

4b.</td>
<td>Consider the following cases.
i). Login form that requires a username and password
ii). To check the patient’s blood pressure vitals.
iii). A text field that accepts alphanumeric characters and has a maximum length of 10 characters.
Write all the possible classes of Test Cases using Equivalence Class Partitioning and Boundary Value Analysis techniques to design test cases.

For the following code snippet: i. Draw the Control Flow Graph ii. Write the independent paths iii. Calculate the Cyclomatic Complexity using three different techniques.
<pre>
1. int main()
2. {
3. int i, j;
4. int sum = 0;
5. for (i = 0; i < 5; i++)
6.   {
7.   if (i % 2 == 0)
8.   {
9.   for (j = 0; j < 3; j++)
10.   {
11.   if (j % 2 == 0)
12.   sum += (i + j);
13.   }
14.   }
15.   else
16.   {
17.   sum -= i;
18.   }
19.   }
20.   printf("Sum: %d\n", sum);
21. return 0;
22. }
</pre></td>
<td>10</td>
<td>CO4</td>
<td>L6</td>
</tr>
</table>

Q5a	In a software development project aiming to build a new web-based project management application, the development team has just completed implementing a set of new features and bug fixes. Before proceeding to comprehensive testing phases, they execute testing to ascertain the readiness of the build for further testing. It checks if critical functionalities such as user authentication, project creation, and task assignment are functioning correctly. However, it does not delve into finer details. The team aims to build a new software which is stable enough to proceed to the next testing phase. **Explain the type of testing used in this scenario with help of a suitable diagram.**	10	CO4	L6
5b	A Software development team is generating test cases for an APP that aims to test if the person should GO for a Walk or Not considering weather conditions, time of day, day of the week, and personal schedule. If it's raining or stormy outside, staying indoors is the preferred option to avoid getting wet. In the morning, the decision pivots on whether it's a weekday or a weekend and if the personal schedule permits. If it's not morning, the decision simplifies based on whether the weather is sunny or cloudy, with additional consideration for weekends and personal schedules (BUSY or IDLE). **Make a decision table that aims to generate test cases for a clear recommendation on whether to go for a walk today based on all relevant factors and circumstances.**			

Marks Distribution