Time – 3 Hours   Full Marks – 50

Note: Answer any <u>five</u> questions. All parts of a question must be answered at one place.

1.
   (a) Give any four limitations of prototyping model.   **[2]**
   (b) List the components of a feasibility study report.   **[2]**
   (c) Why formal methods are not widely used.   **[2]**
   (d) What do you mean by Structured Language Specification? Specify the requirements of a software system of your choice using Tabular Specification.   **[4]**

2.
   (a) Explain briefly about Early design and Post-architecture model of COCOMO II.   **[4]**
   (b) Use the COCOMO II model to estimate the effort required to build software for a simple ATM that produces 10 screens, 8 reports, and will require approximately 70 software components. Assume medium complexity and medium developer/environment maturity. Use the application composition model with object points.   **[6]**

3. You have been asked to build a web-based course registration system for NIT Rourkela.
   (a) Define a class diagram for the above system.   **[5]**
   (b) Develop a complete set of Class-Responsibility-Collaborator (CRC) model index cards on the above system.   **[5]**

4.
   (a) Explain briefly about the types of data models?   **[3]**
   (b) Give any two important characteristics of a good data model?   **[2]**
   (c) NIT Rourkela registrar's office maintains data about the following entities: (i) courses, including number, title, credits, syllabus, and prerequisites; (ii) course offerings, including course number, year, semester, section number, course instructor(s), timings, and classroom; (iii) students, including student-id, name, and program; and (iv) instructors, including identification number, name, department, and title. Further, the enrollment of students in courses and grades awarded to students in each course they are enrolled for must be appropriately modeled. Construct an E-R diagram for the registrar's office. Mention clearly all assumptions that you make about the mapping constraints.   **[5]**

P.T.O

5. Consider a restaurant software ordering system. The system should allow the waiter to handle customers' orders by adding them, cancelling them, scheduling parts of the order (to make the starter arrive earlier than the main course). The cashier should be allowed to let customers pay for their meals, and print receipts.

    (a) Draw a use case diagram for a restaurant ordering system. **[2]**

    (b) Show the activity of processing a meal order within the system using an activity diagram. **[3]**

    (c) Show the use case realization through Sequence and Collaboration diagrams of one of the use cases you have drawn for part (a). **[5]**

6.

    (a) Identify the types of defects that you would be able to detect during code walkthrough. **[2]**

    (b) Design black-box test suites for a function called *find-intersection*. The function *find-intersection* takes four real numbers m_1, c_1, m_2, c_2 as its arguments representing two straight lines $y = m_1 x + c_1$ and $y = m_2 x + c_2$. It determines the points of intersection of the two lines. Depending on the input values to the function, it displays any one of the following messages: **[8]**

        • Single point of intersection

        • Overlapping lines – infinite points of intersection

        • Parallel lines – no points of intersection

        • Invalid input values

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