C8-R3: ADVANCED SOFTWARE ENGINEERING

NOTE:

1. **Answer question 1 and any FOUR from questions 2 to 7.**
2. **Parts of the same question should be answered together and in the same sequence.**

Time: 3 Hours **Total Marks: 100**

1. Briefly answer each of the following questions.

a) List four metrics that can be determined from a static analysis of the source code of an object-oriented program and would correlate well with the reliability of the delivered software.

b) Do you agree with the following statement: "The chronilogical order of the message in a UML sequence diagram can be determined from an inspection of the diagram." Justify your answer.

c) Define the term cohesion in the context of object-oriented design of a system.

d) Is the number of loops of the spiral in the spiral life cycle model fixed? If your answer is affirmative, write down the exact number of loops of the spiral. If your answer is negative, explain how the number of loops of the spiral is determined.

e) What do you understand by use case driven development?

f) Do you agree with the following statement? "A large number of message exchanges among object during the realization of a use case indicates effective delegation of responsibilities and is a sign of good design." Justify your answer.

g) Briefly explain how can formal techniques be used in every phase of software development. What would be the advantages and disadvantages of this approach?

(7x4)

2. Consider the following software that needs to be developed to automate the prize scheme of a supermarket.

Supermarket Prize Scheme (SPS) Software:

A supermarket needs to develop the following software to encourage regular customers. For this, the customer needs to supply his/her residence name, address and telephone number to the staff manning the checkout counter. Each customer who registers for this scheme is assigned a unique customer number (CN) by the computer. Based on the generated CN, an office clerk manually prepares a customer identity card after getting the market manager's signature on it. A customer can present his customer identity card to the check out staff when he makes any purchase. In this case, the value of his purchase is credited against his CN. At the end of each year, the supermarket intends to award surprise gifts to 10 customers who make the highest total purchase over the year. Also, it intends to award a 22 caret gold coin to every customer whose purchase over the year exceeds Rs. 10,000/-. The entries against the CN are reset as soon as the prize winners' list are generated.

In addition to the above, you can make suitable assumptions regarding the details of various features of SPS software but you must clealy write down your assumptions.

a) Identify the use cases and develop the use case diagrams.

b) Develop the class diagram and represent it using UML notation.

c) Develop the sequence diagram for each identified use case.

(6+6+6)

3.

a) What do you understand by component-based software engineering? Briefly explain this development process. What are its advantages over the traditional development process?

b) Draw a class diagram using the UML syntax to represent the following aspects concerning a library. An issuable can either be a book or a CD. Books can be either refernece books or text books. The details of various issuables are maintained in a register called the issuable register. The library has many members whose details are maintained in a member register. A member can issue upto 10 text books for a month. A member can also issue two CDs for a week.

(9+9)

4.

a) Name four important design characteristics that need to be considered to judge which among two alternate object-oriented designs to a problem is the better solution?

b) Abstraction and decomposition are two fundamental principles to tackle complexity. Explain how these two principles are used in object-oriented designs to tackle complexity. Explain your answer using suitable examples.

c) What do you understand by requirements elicitation? Name the different requirements elicitation activities that an analyst undertakes for elicitating customer requirements. Explain your answer with suitable examples.

(6+6+6)

5.

a) Using a least one example for each case, explain what you understand by the following types of relations among classes and give the UML representation of each:
   * *association,*
   * *generalization*, and
   * *aggregation (is-part of)*

b) In the context of object-oriented software development, distinguish between analysis and design with respect to aim, methodology and the documentation technique used.

c) Considering the fact that algorithms are reused in different applications, how are design patterns differnt from algorithms? Explain any one of the popular design patterns and how it can be used in a design. Point out how use of this design pattern would be advantageous.

([6+6+6)

6.

a) Can an object-oriented program be effectively tested by testing each of the methods then integrating the methods and finally performing system testing? If your answer is “yes”, explain how the individual methods can be tested. If your answer is “no”, explain the reasoning behind your answer.

b) Discuss three metrics that can be used to estimate the effort required to test an object-oriented software.

c) What do you understand by software architecture? Explain event-driven architecture and its advantages.

(6+6+6)

7.

a) What is a multi-agent system? Discuss the features and issues involved in developing a multi-agent system. Can Spiral Model of software development be used for such systems?

b) What is the role of pipes and filters in software architecture? Why is it advantageous to use pipes and filters?

c) What is the differenc between a use case and a scenario? Identify at least three scenarios associated with the withdrawl cash use case of a standard bank ATM.

(6+6+6)