

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

September / October 2022 Supplementary Examinations

Programme: B.E.

Semester: VI

Branch: Computer Science and Engineering

Duration: 3 hrs.

Course Code: 20CS6PCOMD

Max Marks: 100

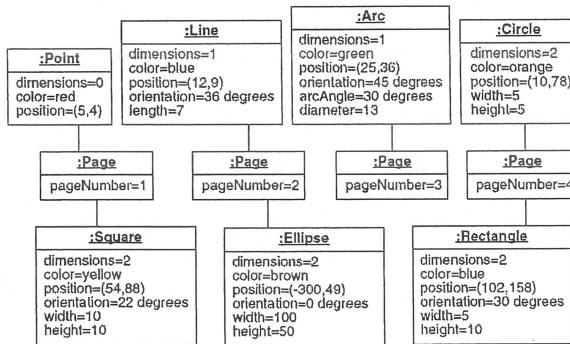
Course: Object Oriented Modelling and Design

Date: 29.09.2022

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

- 1 a) List and explain the stages in Object Oriented methodology. 6
- b) Analyze the below object diagram and Prepare a class diagram. This particular document has four pages. The first page has a red point and a yellow square displayed on it. The second page contains a line and an ellipse. An arc, a circle, and a rectangle appear on the last two pages. while preparing your diagram, use one or more generalizations. 6



- c) Prepare a class diagram for **Managing Credit Card Accounts** group of classes given below. Add relationships (association & generalization) to diagram. Use association names and operations. multiplicity. Explain your diagram. 8

Credit Card Account, Institution, Mailing Address, Customer, Statement, Transaction, Cash Advance, Interest, Purchase, Fee, Adjustment, Merchant.

UNIT - II

- 2 a) Differentiate between 6
 i) Aggregation and Association with relevant example
 ii) Transition and Conditions with example
- b) Prepare & explain a class diagram for a graphical document editor that supports grouping. Assume that a document consists of several sheets. Each sheet contains drawing objects, including text, geometrical objects, and groups. A group is simply a set of drawing objects, possibly including other

groups. A group must contain at least two drawing objects. A drawing object can be a direct member of at most one group. Geometrical objects include circles, ellipses, rectangles, lines, and squares.

- c) Analyze the restructuring techniques used to deal the multiple inheritance issue with relevant examples 8

OR

- 3 a) Analyze the following relationships and categorize into generalization, aggregation, association or ternary association. Explain your answers 6

- i) A dining philosopher uses a fork
- ii) File contains records.
- iii) A route connects two cities
- iv) A polygon is composed of ordered set of points
- v) A person uses a computer language on a project
- vi) A person plays for a team in a certain year

- b) Design a simple State Model for a copy machine. Initially the copy machine is off. When power is turned on, the machine reverts to a default state—one copy, automatic contrast, and normal size. While the machine is warming, it flashes the ready light. When the machine completes internal testing, the ready light stops flashing and remains on. Then the machine is ready for copying. The operator may change any of the parameters when the machine is ready. The operator may increment or decrement the number of copies, change the size, toggle between automatic and manual contrast, and change the contrast when auto contrast is disabled. When the parameters are properly set, the operator pushes the start button to begin making copies. Ordinarily, copying proceeds until all copies are made. Occasionally the machine may jam or run out of paper. When the machine jams, the operator may clear the blockage and the machine will resume making copies. Adding paper allows the machine to proceed after running out of paper. Extend the diagram for the following observations. The copy machine does not work quite right. When it jams, the operator must first remove the jammed paper and then turn the machine off and on before it will operate correctly again. If the machine is turned off and on without first removing the offending paper, the machine stays jammed. 6

- c) i. Prepare a portion of class diagram for a library book check out system that shows the late charges for an overdue book as a derived attribute. 8

- ii. Considering chess game as an example, analyze and explain One-shot State diagram.

UNIT - III

- 4 a) Analyze the different ways of concurrency handling in state modeling with relevant examples. 6
- b) Consider the financial organization which offers loans to the customers. The customers of this organization can get loan based on pledging any of the source to get the loan of required amount i.e. the gold, the life insurance policies or the proof of the service where the customer is working along with the salary certificate. 6

If a customer wants to apply for the loan by pledging all the three sources, show how the verification and validation of these sources take place before the loan is sanctioned to the customer.

Construct an activity diagram for this process. Use swimlanes to show the various interactions.

- c) (i) A product is to be installed to control elevators in a building with m floors. The problem concerns the logic required to move elevators between floors according to the following constraints:

- Each elevator has a set of m buttons, one for each floor. These illuminate when pressed and cause the elevator to visit the corresponding floor. The illumination is canceled when the elevator visits the corresponding floor.
 - Each floor, except the first floor and top floor has two buttons, one to request and up-elevator and one to request a down-elevator. These buttons illuminate when pressed. The illumination is canceled when an elevator visits the floor and then moves in the desired direction.
 - When an elevator has no requests, it remains at its current floor with its doors closed.

Draw the sequence diagram for the above scenario including Advanced concepts.

(ii) Consider an online shopping System, for the below set of use cases, prepare a use case diagram using include, extend and generalization relationships.

- a) Take customer order
 - b) Identify customer
 - c) Sell Customer specific product
 - d) Handle customer transaction
 - e) Return faulty goods

Note: Consider Sales Assistant as the actor for this application

OR

- 5 a) List and explain the guidelines for constructing Use case Model.

b) Consider software that manages electronic music files. Some uses cases are listed below. Analyze and prepare use case diagram and include the appropriate relationships (such as include, extend and generalization) for the use cases. You can add an abstract parent for each use case generalization.

 - **Play a song:** add the song to the end of the play queue
 - **Play a library:** add the songs in the library to the play queue
 - **Randomize order:** Randomly reorder the songs in the play queue.
 - **Delete a song:** Delete a song from a music library
 - **Destroy a song:** Delete a song from all music libraries and delete the underlined file
 - **Add a song:** add a music file to a music library
 - **Create music library :** Create a music library that contains no songs
 - **Delete a music library :** Delete the music library
 - **Destroy a music library :** Destroy all songs in the music library and

- then Delete the music library
- **View songs by title:** Display the songs in a music library sorted by title
- **View songs by Artist:** Display the songs in a music library sorted by Artist
- **View songs by album:** Display the songs in a music library sorted by album
- **Start play:** start playing songs from the queue. If previously stopped, resume playing from last position, otherwise start playing at the start if the queue.
- **Stop play:** Suspend playing of music.

c) (i) Consider a Flight ticket reservation system.

- I) List three use cases at a comparable level of abstraction. Summarize the purpose of each use case with a sentence.
II) Prepare a Sequence diagram for a Flight ticket reservation system
include advanced concepts.

8

(ii) A customer decides to upgrade her PC and purchase a DVD player. She begins by calling the sales department of the PC vendor and they tell her to talk to customer support. She then calls customer support and they put her on hold while talking to engineering. Finally, customer support tells the customer about several supported DVD options. The customer chooses a DVD and it is shipped by the mail department. The customer receives the DVD, installs it satisfactorily, and then mails her payment to accounting. Construct an activity diagram for this process. Use swimlanes to show the various interactions.

UNIT - IV

6 a) (i) Consider a new antilock braking system for crash avoidance in an automobile. Elaborate the following high-level questions and explain your answers.

- Who is the application for?
- Who are the stakeholders?
- Identify three systems with which it should work

6

(ii) Prepare a problem statement for Change Making Machine System, you may limit the scope of the system, but be precise and avoid implementation decisions.

b) Identify the steps involved in constructing an Application State model. Choose ATM as an example.

6

c) i) Analyze each of the following systems- ATM machine and Bridge Player. Identify and explain the relative importance of the three aspects of modeling: Class Modeling, State Modeling, Interaction Modeling for the above two systems.

8

ii) The following is a list of candidate classes for **Online Semester End Examination**. Explain the criteria that are taken into consideration for keeping the right classes and list the good classes.

List of classes to be eliminated along with reasons:

Scheduling software, meeting, meeting-link, student, usn, student name, coe, starttime, endtime, timetable, schedule, marks, slot, time, batch, batch-no, attendance, acceptance status, meeting invoice, invitation meeting information, invitee, notice, internal examiner, external examiner.

UNIT - V

- 7 a) "A good way to implement a system is to focus on the system design even if it sacrifices some of the requirements". Discuss your view on the above statement with the tasks involved in the optimization of the design. 6
- b) Consider a system for interactive symbolic manipulation of polynomials. The basic idea is to allow a mathematician to be more accurate and productive in developing formulas. The user enters mathematical expressions and commands a line at a time. Expressions are ratios of polynomials, which are constructed from constants and variables. Intermediate expressions may be assigned to variables for later recall. Operations include addition, subtraction, multiplication, division and differentiation with respect to a variable.
Design an architecture for the system described above could involve the following subsystem. Organize them into partitions and layers
i. Line syntax-- Scan a line of user input for tokens
ii. Line semantics—determine the meaning of a line of input
iii. Command processing—execute user input, error checking
iv. Construct expression—build an internal representation of an input expression
v. Apply operation—carry out an operation on one or more expressions
vi. Save work—save the current context
vii. Load work—read in previously saved context
viii. Substitute—substitute one expression for a variable in another expression
ix. Rationalize—convert an expression to canonical form
x. Evaluate—replace a variable in an expression with a constant and simplify the expression
- c) Justify that it is helpful to fine-tune classes before writing code in order to improve performance. 8
