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

Autonomous Institute Affiliated to VTU

May / June 2019 Semester End Main Examinations

Programme: B.E. | **Semester : VI**
Branch : Computer Science And Engineering | **Duration: 3 hrs.**
Course Code: 16CS6DCOOM | **Max Marks: 100**
Course: Object Oriented Modeling and Design | **Date: 30.05.2019**

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

UNIT - I

1. a) Explain the different restructuring techniques of workaround for multiple inheritance with an example **08**

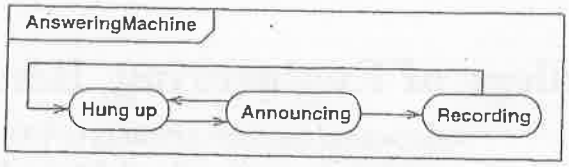
b) Analyze the following relationships and categorize into generalization, aggregation, association or ternary association. Explain your answers **05**
   i) A dining philosopher uses a fork
   ii) A file is an ordinary file or directory file
   iii) File contains records.
   iv) A polygon is composed of ordered set of points
   v) A person plays for a team in a certain year

c) Prepare a class diagram for a graphical document editor that supports grouping. Assume that a document consist 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, rectangle, lines and squares. **07**

OR

2. a) Discuss two kinds of state diagrams with an example **06**

b) Consider the partially completed state diagram below for the control of a telephone answering machine. The machine detects an incoming call on the first ring and answers the call with a prerecorded announcement. When the announcement is complete, the machine records the caller's message. When the caller hangs up, the machine hangs up and shuts off. Place the following in the diagram: call detected, answer call, play announcement, record message, caller hangs up, announcement complete. **06**



c) Prepare a State diagram for the following scenario. **08**

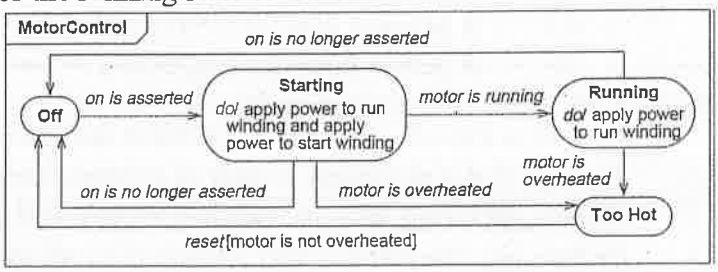
Consider the class for telephone line with following activities and states: As a start of a call, the telephone line is idle. When the phone receiver is picked from hook, it gives a dial tone and can accept the dialing of digits. If after getting dial tone, if the user doesn't dial number within time interval then time out occurs and phone line gets idle. After dialing a number, if the number is invalid then some recorded message is played. Upon entry of a valid number, the phone system tries to connect a call & routes it to proper destination.

If the called person answers the phone, the conversation can occur. When called person hangs up, the phone disconnects and goes to idle state. Draw the state transition diagram for above description of telephone line.

UNIT - II

3. a) Discuss the different ways of concurrency handling in state modeling with an example. **08**

b) Revise the below state diagram to nested state diagram by noting the commonality of the starting and running states. There is a transition from either the starting or the running state to the off state when "on" is not wanted. **05**



c) Prepare nested state diagram for the following scenario **07**

ATM is initially turned off. After the power is turned on, ATM performs startup action and enters Self Test state. If the test fails, ATM goes into Out of Service state, otherwise there is triggerless transition to the Idle state. In this state ATM waits for customer interaction.

The ATM state changes from Idle to Serving Customer when the customer inserts banking or credit card in the ATMs card reader. On entering the Serving Customer state, the entry action read Card is performed. Note, that transition from Serving Customer state back to the Idle state could be triggered by cancel event as the customer could cancel transaction at any time. Serving Customer state is a composite state with sequential substates Customer Authentication, Selecting Transaction and Transaction. Customer authentication and Transaction are composite states by themselves which is shown with hidden decomposition indicator icon. Serving Customer state has triggerless transition back to the Idle state after transaction is finished. The state also has exit action ejectCard which releases customer's card on leaving the state, no matter what caused the transition out of the state.

OR

4. a) Explain Procedural Sequence models with suitable examples. **06**

b) 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: **06**

i. 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.

ii. Each floor, except the first floor and top floor has two buttons, one to request a 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.

iii. When an elevator has no requests, it remains at its current floor with its doors closed.

Draw the sequence diagram for the above scenario.

c) A library lends books and magazines to members, who are registered in the system. Also it handles the purchase of new titles for the library. Popular titles are bought in multiple copies. Old books and magazines are removed when they are out of date or in poor condition. A member can reserve a book or magazine that is not currently available in the library, so that when it is returned or purchased by the library, the person is notified. The library can easily create, replace and delete informations about the titles, members loans and reservations in the system. Create a Usecase diagram for the above problem definition. **08**

UNIT - III

5. a) Define System Conception. List and explain the questions that must be answered by a good system concept. **06**

b) Analyze the following systems, identify the relative importance of the three aspects of modeling: 1) class modeling 2) state modeling 3) interaction modeling. Explain your answers. **06**

i. Change-making machine
ii. Electronic typewriter
iii. Telephone answering machine
iv. Spelling checker

c) Explain with an example, the steps for constructing an Application class Model. **08**

UNIT - IV

6. a) Explain the ways of Downward Recursion in the design process. **06**

b) Analyze the following systems, list the applicable style of system architecture: batch transformation, continuous transformation, interactive interface, dynamic simulation, real-time system, and transaction manager. Explain your answer. **06**

i. An electronic chess companion: The system consists of a chess board with a built-in computer, lights, and membrane switches. The human player registers moves by pressing chess pieces on the board, activating membrane switches mounted under each square. The computer indicates moves through lights also mounted under each square. The human moves the chess pieces for the computer. The computer should make only legal moves, should reject attempted illegal moves, should reject attempted illegal human moves, and should try to win.

ii. An airplane flight simulator for a video game system: The video game system has already been implemented and consists of a computer with joystick and pushbutton inputs and an output interface for a color television. Your job is to develop the software for the computer to display the view from the cockpit of an airplane. The joystick and pushbutton control the airplane. The display should be based on a terrain description stored in memory. When your program is complete, it will be sold on cartridges that plug into the video game system.

iii. A floppy disk controller chip: The chip is going to use a microprogram for internal control. You are concerned with the microprogram. The chip bridges the gap between a computer and a floppy disk drive. Your portion of the control will be responsible for positioning the read/write head and reading the data. Information on the diskette is organized into tracks and sectors. Tracks are equally spaced circles of data on the diskette. Data within a track is organized into sectors. Your architecture will need to support the following operations: Find track 0, find a given track, read a track, read a sector, write a track, and write a sector.

iv. A sonar system: You are concerned with the portion of the system that detects under sea objects and computes how far away they are. This is done by transmitting an acoustic pulse and analyzing any resulting echo. A technique called correlation is used to perform the analysis, in which a time-delayed copy of the transmitted pulse is multiplied by the returned echo and integrated for many values of time delay. If the result is large for a particular value of time delay, it is an indication that there is an object with a range that corresponds to that delay.

c) Explain the reusable components used in System Design. **08**

UNIT - V

7. a) Explain the different possibilities of fine tuning classes to be considered before implementation. **08**

b) Consider software that manages electronic music files. Some uses cases are listed below. Prepare use case diagram and include the appropriate relationships for the use cases. You can add an abstract parent for each use case generalization. **05**

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

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

c) A company is manufacturing a new product and must coordinate several departments. The product starts out as a raw marketing idea that goes to engineering. Engineering simulates the function of the product and prepares a design. Manufacturing reviews the design and adjusts it to confirm to existing machinery. Engineering approves the revisions and customer service then looks at the design- a good design must enable ready repair. Engineering approves the customer service proposals and ensures that the resulting design still meets the target functionality. **07**

Construct an activity diagram for this process. Use swimlanes to show the various interactions. Show the changes in the state of the design as the activity diagram proceeds.

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