

## COMP356/COMP556: Object Modelling and Object Oriented Design Methods (Exam Paper)

**Instructions.** Credits will be given for the best two answers only.

- Question 1**
- (a) Define the term inheritance and give an example using either a graphical notation (e.g. OMT, UML) or a programming language (e.g. C++, Java). (6 marks)
  - (b) Define the term multiple inheritance and draw an example object diagram where this type of relationship occurs. (6 marks)
  - (c) Describe with an object diagram how to avoid multiple inheritance using
    - i. nested inheritance (4 marks)
    - ii. delegation (6 marks)
  - (d) Draw an object diagram showing at least 10 relationships among the following object classes. Include associations, aggregations and generalisations. Name all the associations you create.
    - i. school, playground, principal, school board, classroom, book, student, teacher, cafeteria, rest room, computer, desk, chair, ruler, door, swing. (14 marks)
    - ii. file system, file, directory, file name, ASCII file, executable file, directory file, disk, drive, track, sector. (14 marks)
- Question 2**
- (a) Give a definition of encapsulation and polymorphism and explain what advantages they give to an object-oriented design. (10 marks)
  - (b) Explain what dynamic method binding means. Give an example of object diagram that will use, when implemented, some mechanism for dynamic method binding. (20 marks)
  - (c) Explain how this is implemented using object descriptors. (20 marks)
- Question 3**
- (a) Give a definition of event, interaction, state and state diagram. (12 marks)
  - (b) Describe one possible way to translate the state diagram associated to a particular object into code. (14 marks)
  - (c) Expand the plane behaviour described by the state diagram in Figure 1 to satisfy the following additional specifications.

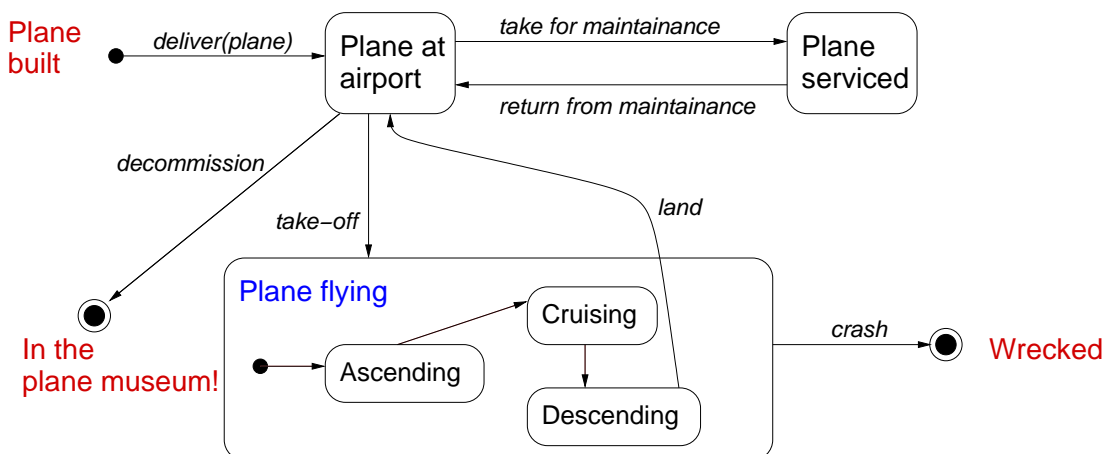


Figure 1: State diagram for an airplane.

- i. While at the airport the airplane can either be parked somewhere, or getting ready to take off, or completing a landing. When delivered the plane is parked and it starts getting ready when a flight call occurs. A fault in the airplane can be found either while the plane is idle or while it is getting ready or while it is completing a landing, and this event causes the plane to be serviced. When the aircraft lands it enters the substate completing a landing and from there it moves to the idle state (i.e. it cannot start getting ready for a new departure without having been idle for a while). **(8 marks)**
- ii. If the plane is getting ready to take off two sets of checks are carried out simultaneously: (1) the pilot checks the engine and then, when this activity is complete, checks the weights distribution, and (2) the crew on board describe the safety procedures and then check the all passengers are ok. When all this is completed take off occurs. **(8 marks)**
- iii. While the plane is cruising a movie is shown and at the same time members of the crew serve snacks and drinks. **(8 marks)**