

EGT3
ENGINEERING TRIPOS PART IIB

Monday 30 April 2018 2 to 3.40

Module 4M21

SOFTWARE ENGINEERING AND DESIGN

*Answer not more than **three** questions.*

All questions carry the same number of marks.

*The **approximate** percentage of marks allocated to each part of a question is indicated in the right margin.*

There are no attachments.

STATIONERY REQUIREMENTS

Single-sided script paper

SPECIAL REQUIREMENTS TO BE SUPPLIED FOR THIS EXAM

Engineering Data Book

CUED approved calculator allowed

10 minutes reading time is allowed for this paper at the start of the exam.

You may not start to read the questions printed on the subsequent pages of this question paper until instructed to do so.

1 (a) Provide a definition for *Class Diagram*. Explain why a *Class Diagram* alone is not sufficient to describe a system and identify another type of diagram that can be useful. [10%]

(b) A surgery has a computer system that maintains a list of general practitioners (GPs) working in the surgery and patients it provides care for. The system keeps contact details of GPs and patients and stores patients' personal information such as date of birth and medical records as well as GPs' qualifications.

The system allows surgery staff to schedule appointments for patients to see their GP. The receptionist can access the system by looking up the patient (assume that the name and address identify the patient uniquely), establishing their allocated GP and checking the list of the GP's appointments. Once a suitable time slot is identified, the receptionist can add a new appointment to the system.

(i) Design the system described above. Provide an illustration of the design with the help of a *Class Diagram*. [30%]

(ii) Draw a *Sequence Diagram* to demonstrate a scenario for a receptionist using the system to make an appointment for a patient. [30%]

(iii) Extend your design to allow the system to send a notification to the patient using their preferred notification method (a text message or email) once the appointment is scheduled. Update the *Class* and *Sequence Diagrams* to illustrate this extension. [30%]

2 (a) Define *Refactoring*. [10%]

(b) A simple mobile application allows the user to draw primitive shapes: rectangles, triangles and circles. Once drawn, the user can tap on a shape to select it and choose its colour. The *Class Diagram* in Fig. 1 shows the main *Classes*.

(i) Review the design and, using *Refactoring* techniques, improve it by generalising shape classes. [30%]

(ii) Identify a *Design Pattern* to add the *Undo* functionality for changing the colour of a shape. Draw the *Class Diagram* for the updated design. [30%]

(iii) Draw the *Sequence Diagram* to demonstrate changing the colour of a shape and then using the *Undo* functionality to revert the change. [30%]

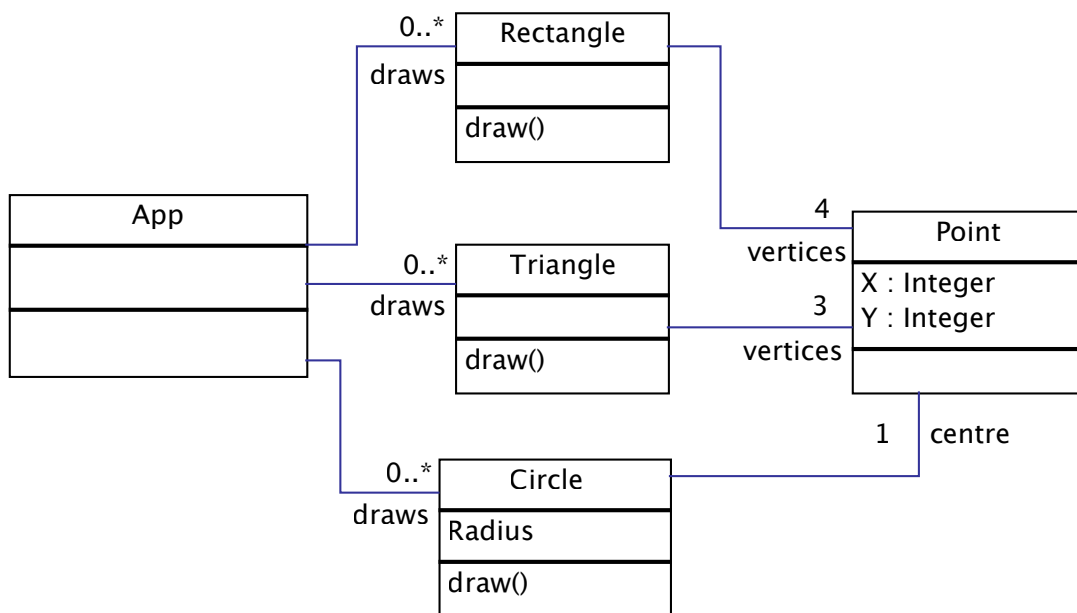


Fig. 1

3 (a) Describe the purpose of *Activity Based Planning* in *User Interface* (UI) design, provide some examples and explain why it can be useful. [10%]

(b) A specialised online video streaming company maintains a website for children and youth to create and share animated videos. The company would like to create an application that customers can download on their tablet and use to discover and watch some popular animated videos. The users should be able to search videos by keywords and watch them online.

(i) Design the UI for a software application for a portable tablet device with a touchscreen that implements this functionality. Identify all main screens and interaction elements and explain their purpose and design constraints. [30%]

(ii) Extend the functionality of the application by allowing the users to go back to recently watched videos, mark some of the videos as their Favourites and download videos to their tablet. The users should be able to see all videos added to their Favourites. Identify any additional screens required to support these features. [40%]

(iii) Having analysed the application statistics, it has been discovered that a large percentage of users downloaded the application on their smartphone instead of a tablet. Optimise the design of the application to improve the user experience on smartphone devices. [20%]

4 A large company specialising in bespoke software development has won a contract to deliver a software tool for monitoring a particular parameter in the operation of a new generation nuclear power plant.

(a) Describe the *Team* that is likely to be working on the project and clearly define their roles and responsibilities. [20%]

(b) Specify the *Software Model* that is likely to be employed for the development of the software. List the key stages in the development process and explain the advantages of this approach for this type of software. [20%]

(c) Discuss what could go wrong with the project and what sort of risks the company should be prepared to mitigate. [30%]

(d) Describe the measures that the company could implement to reduce the likelihood of any potential crises in the project. [30%]

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