PAPER CODE NO.
COMP 319

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UNIVERSITY OF LIVERPOOL

January 2021 Examination

COMP319 : SOFTWARE ENGINEERING II

INSTRUCTIONS TO CANDIDATES

- The exam consists of 3 questions. You must answer ALL questions
- The expected writing time for the exam is 3 hours
- You may write your answers using a word processor (please export the document to pdf before submitting), or you may write your answers by hand and either scan them, or take photos of them. If you write your answers by hand, then both the handwriting and the scanned copy must be legible in order to be accepted.
- The exam will be released at Monday 18th January at 9.00 am. You will then have 24 hours in which to prepare your answers, and the final deadline for submissions is Tuesday 19th January at 9.00 am.
- Submit your answers to please submit via Canvas.
- Late submissions will **not** be accepted.
- You may use a calculator.

Q1 You have been asked by your manager to design a track and trace system for getting in touch with people who may have been in contact with other infected people. The system will have to be able to send messages via the following media, options depending on the user's preferences:

email
SMS text
Twitter

So if email is preferred only an email message is sent, if Twitter only a twitter message is sent, etc.

Illustrate with example code and using the Chain of Responsibility and Factory class, how you would implement this scheme. It is important that is easy to add new message types in future implementations.
(No actual API code for Twitter, email or SMS
needs to be shown but this should be indicated via TO DO comments, for example
// TO DO send email to address stored here
The classes should comply with Meyer's Open/Closed principle where appropriate. All messages should be sub-classes of an abstract class called Message which represents a track and trace message. Each message needs a sender, a recipient as well as a message body. All message addresses should be validated when the message is constructed. The code should also comply with the Façade interface, with all the service provided via the chain of responsibility interface.

There is a class, called Person which contains the user's preferences as follows;

```
public class Person {
        public static final int EMAIL=1;
        public static final int SMS=2;
        public static final int TWITTER=3;
        private String sendAddress;
        public String getSendAddress() {
            return(this.sendAddress);
        }
        private int messagingPreference=0;     // Message preference
        public final int getMessagingPreference() {
             return(messagingPreference);
        }
}
```

a) Correct code for Message factory and all other message classes. **[15 Marks]**

b) Correct outline of Chain of Responsibility **[15 Marks]**

Q2 Three organisations are involved in the production of software and have been measuring their project development performance over a period of 5 years. Each organisation made an estimated timescale for each project The results are shown in Table 1.

Organisation	Year 1	Year 2	Year 3	Year 4	Year 5
Company A	45	50	45	50	80
Company B	79	98	95	96	95
Company C	20	22	23	14	22

Table 1 Percentage of projects completed within time schedule with all features implemented

The EQF for organisation A is 10.5 and for organisation B is 2.2 and organisation C is 8.8

(a) Discuss in detail what conclusions you can draw from this data if any about the performance of each of these organisation in terms of success in delivering and managing software projects.

[15 Marks]

(b) What technique could you use to determine what if any bias was present in the estimation approach used by each of the companies?

[6 Marks]

(c) How would estimation bias effect the figures shown in Table 1?

[4 Marks]

(d) What other approach could you use to try and accurately measure the relative software productivity of these 2 companies? **[5 Marks]**

Q3 A company wishes to develop a high performance platform to deal with order processing for an e-commerce web site.

i) Describe how the Actor model could be used to help design and develop this benefit this type of application and what benefits this approach will provide. **[18 Mark]**

ii) For each order, there is a set process which the order must be handled by
Step1) The customer clicks on buy on the web site and their order is stored indicating product id, amount of product and delivery address.
Step 2) If the product is out of stock, the order is set to pending status and the customer is informed and the process is delayed until the product is in-stock or the customer cancels the order
Step 3) When the product is in stock, the customer's card details are checked for validity, and then a payment charged on the card. If the payment cannot be taken the order is changed to payment-waiting status.
Step 4) If the payment is successful, the order moves to dispatch-waiting status
Step 5) Orders that are in dispatch-waiting status are sent to the warehouse staff, once the order is picked, packaged and sent the order is moved to the sent status.
Step 6) If/when the order is delivered by the courier, the order moves to the received status.

Given you have the following actors for your system;
Customer, Order, CustomerPaymentHandler, Warehouse-Staff, Courier , and assuming that the Customer actor contains details of the customer's card details and delivery address.

a) Describe the attributes, name and type we would need for the actors Order and CustomerPaymentHandler. **[6 Marks]**
b) Show the messages and actor creation that would be needed for a new order assuming the product is in stock and payment and delivery are successful. **[6 Marks]**