



(Closed Book Test)

Date: 9th December 2017

Time: 9.30 – 12.30 hrs

You must answer question 1 from Part A and any 3 questions from Part B.

Part A

Question 1

Answer all questions considering the scenario given below.

The Management Board of a supermarket chain wants a mobile application developed to be given for their customers which would make their grocery shopping easy.

Their main requirements are listed here;

1. When the barcode of a grocery item is scanned to generate a bill, the data about that item is captured and stored in a way that can be used in future. For example, if a customer wants to see when he/she bought sugar last time, the date will be shown in the mobile app.
2. Based on the previous shopping details the customer would know when to buy a particular item (e.g. sugar) again.
3. The app should predict weekly and monthly consumption of selected items such as sugar.
4. Management Board of the supermarket also would get to see a monthly report showing the consumption pattern of those selected items.
5. Registered suppliers will be notified of the consumption pattern of those selected items.

Please state your assumptions clearly when answering the questions.

- (a) Draw a complete use case diagram to illustrate the given requirements. (16 marks)
- (b) Draw a class diagram with attributes, relationships and operations to support the business processes in the use case diagram. (15 marks)
- (c) Write two non-functional requirements that should be given for this scenario. (04 marks)
- (d) When does code reviews are carried out on code? Name the review techniques performed by the development team. (05 marks)

Part B Answer only three (3) Questions**Question 2**

Software developers make errors, which lead to faults in the product. Types of fault are categorized into being documentation or usability problems. Fault manifest themselves by causing failure when the product is being used. Failures vary in severity, which is a cost to the user.

(Hint: Failure - departure from expected behavior. If the user complains a failure has occurred.)

- a) Use a coding example to briefly explain the terms error and fault. (04 marks)
- b) To increase the reliability of safety critical system from failure you may decide to use;
 - i. Design diversity or
 - ii. Redundancy

Briefly describe how reliability is obtained in each. (06 marks)

- c) What are the test that should be applied to a simple loop where n is the maximum number of allowable passes through the loop (Consider White box testing and state any assumptions made). (04 marks)
- d) Design test cases for a login page with two text boxes and one button. (06 marks)

Question 3

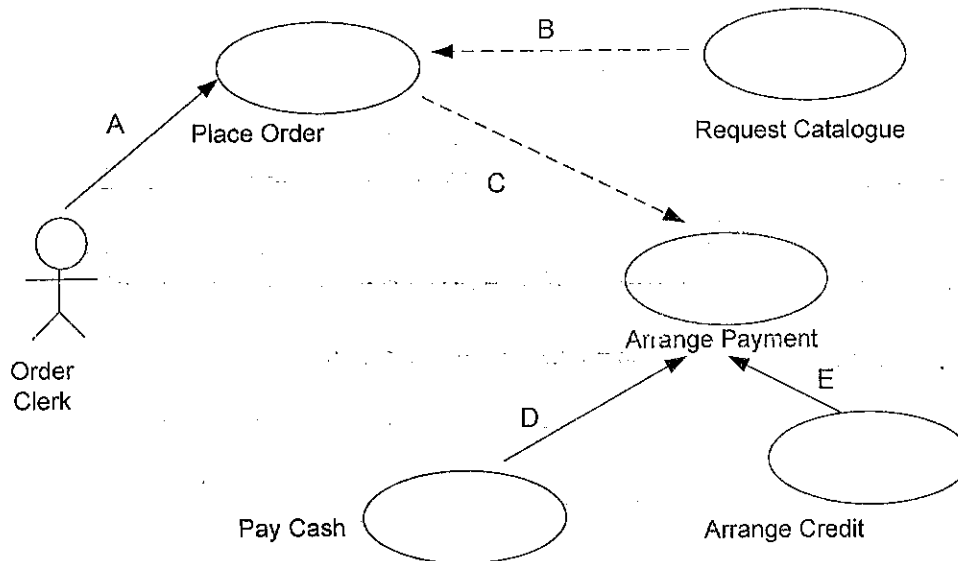
A software development company has a metric program which the following measurements are collected for each separate development project;

- total effort (in person years)
- total number of lines of Code
- total number of faults recorded during testing

- a) Describe 3 objectives that could be addressed by this set of measures (06 marks)
- b) For each measurement, describe the goal to be addressed and how the metrics may enable you to understand or meet the goal. (03 marks)
- c) What is the main advantage of using functions or object points compared to estimates of program size in lines of code? (04 marks)
- d) What is the process model you would select for a medium size software system, if it is given that; the phases of software construction are interleaved, i.e. in several stages, and user feedback is necessary throughout the entire process as the requirements are not well understood? Justify your answer. (07 marks)

Question 4

- a) Describe the use case diagram below in your own words explaining the relationships between the processes. (08 marks)



b) Differentiate between composition and aggregation relationships.

(04 marks)

c) Draw the class diagrams for the class structure given below and identify the relationships among those.

(08 marks)

```

/** Bank Interface */
public interface Bank {
    public abstract String getAccount();
}

/** Ithuru Bank class */
public class IthuruBank implements Bank {
    public String getAccount() {
        return "Ithuru Savings Account";
    }
}

/** SavingsTop Bank class */
public class SavingsTopBank implements Bank {
    public String getAccount() {
        return SavingsTop Savings Account";
    }
}

/** Customer class */
public class Customer {
    private Bank bank;
    public Investor(Bank bank) {
        this.bank = bank;
    }
    public void setBank(Bank bank) {
        this.bank = bank;
    }
    public String openAccount() {
        return "I have an account of " + this.bank.getAdvice();
    }
}
  
```

Question 5

Table given below represents the details of companies who outsource their projects to many different contractors. These contractors have to register in the particular company to get projects. The company selects different contractors based on the project type. In the table budget (Table Q5) represents the money that a beneficiary allocated for the projects and the value represents the money that contractor was contracted for a certain project by a certain beneficiary.

Table Q5: Budget

Beneficiary company name	Company registration number	project	Budget Rs. in 1000	contractor	Contractor address	class	Charging rate per head	Value in Rs.1000
XYZ	230	System updating	500	NewTech	25, Park Rd, Col 2	4	60	470
XYZ	230	Networking	1000	NW Consultants	33, Gemunu Rd, Kotte	2	80	990
ABC	790	Networking	700	NW Consultants	33, Gemunu Rd, Kotte	2	80	500
ABC	790	Multimedia	550	eFlash Company	70, 1 st Lane, Pagoda	1	95	550
PQR	321	Database	600	Data Solutions	90, Mel Mw, Col 1	1	95	595
XYZ	230	Software installation	300	NewTech	25, Park Rd, Col 2	4	60	280
PQR	321	Software installation	300	Data Solutions	90, Mel Mw, Col 1	1	95	280

A contractor can work for different beneficiaries and on different project. A beneficiary can have more than one contract running. There may be more than one contractor and more than one beneficiary for a project. The rate per head that a contractor charges depend on contractor class.

- This table is susceptible to update anomalies. Provide examples of how insertion, deletion and modification anomalies can occur in this table. (06 marks)
- Identify functional dependencies among attributes and normalize the data up to 3rd normal form. Indicate the primary keys. (State any assumptions you have made if there is any.) (14 marks)