UNIVERSITI TEKNOLOGI MALAYSIA
MID TERM
SEMESTER II 2020/2021

CODE OF SUBJECT   : SCSJ4383

NAME OF SUBJECT   : SOFTWARE CONSTRUCTION

YEAR / COURSE   : 3/4/SCJ/4SCJ

TIME   :

DATE   :

VENUE   :

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<u>INSTRUCTIONS TO THE STUDENTS</u>:

Answer all questions.
Submission: Answer scheme (type) in .pdf format

Name	
I/C number	
Year/Course	
Section	
Lecturer	

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Question 1 [25 marks]

ANSWER THE FOLLOWING QUESTIONS BASED ON THE HEALTHNET CASE STUDY.

a.   Answer the following questions.

  i.   Describe **TWO (2)** reasons why choose Object oriented programming as core development approach for HealthNet.

          [6 marks]

b.   The backend of the system (server side) will be developed using a web application platform but the frontend (client side) could be accessed from different platforms such as web application, mobile web application, mobile native system that runs on IOS/android and Window. Therefore, your team is responsible to identify a suitable system architecture for the HealthNet system and design the system from the view of construction (detailed design). Your team have to design:

  i.   Software architecture of the backend and frontend of HealthNet system.

          [8 marks]

  ii.   Justify the chosen architecture style.   **[5 marks]**

  iii.   Define and give example for TWO properties of good design; Loose coupling-high cohesion and preventing a code clone.   **[6 marks]**

Question 2 [25 marks]

ANSWER THE FOLLOWING QUESTIONS BASED ON THE HEALTHNET CASE STUDY.

Your team is responsible for developing the HelthNet in which the management has decided to adapt a new approach that will promote cost saving of developing, testing, documenting, and maintaining software assets.

a.   As part of the team, propose a systematic approach for your team to implement a systematic software reuse. Describe the **THREE (3)** main processes that you want your team to implement to realize the software reuse advantages.   **[5 marks]**

b.   Service-Oriented Architecture (SOA) is a style of software design where services are provided to the other components by application components, through a communication protocol over a network. Its principles are independent of vendors and other technologies. In service-oriented architecture, a number of services communicate with each other, in one of two ways: through passing data or through two or more services coordinating an activity. Analyze the case study of HealthNet and identify **TEN (10)** potential Reusable Business Services to support the implementation of SOA in the project.   **[5 marks]**

c.   Based on experiences in previous projects, your management has identified the project costing parameters. For development of HealthNet, the development cost for new code equals RM35 per line, the Relative Cost of Reuse equals 0.15, error rate for new code equals 1.25 errors per kLOC and cost to fix an error equals RM1500. Your team must use the existing source codes from the previous project for the Tenant Management module that consists of 30k line of codes (LOC). Nevertheless, you also estimated to invest extra effort in 8,500 LOC Source Instructions Written for Reuse by Other, with a Relative Cost Written for Reuse equals 1.40. Analyze and calculate the Organizational Return of Investment for this project.
                                                                    [15 marks]

Question 3 [25 marks]

ANSWER THE FOLLOWING QUESTIONS BASED ON THE HEALTHNET CASE STUDY.

    a)   Choose and justify whether the developers of HealthNet System should apply Design by Contract or Defensive Programming.   **[6 marks]**

    b)   your team is responsible for developing a system from the view of design by contract approach. Please provide the following:

        i.   Describe in detail the **PRE**, **PROCESS** and **POST** condition for each function; *MedicalOrder, MedicalDelivery*

                                                [9 marks]

        ii.   Apply **ASSERT** and **INVARIANT** in the pseudocode for *OrderStatus* function   **[10 marks]**

Question 4 [25 marks]

ANSWER THE FOLLOWING QUESTIONS BASED ON THE HEALTHNET CASE STUDY.

Case Study
HealthNet provides health care and related services to Malaysia. It is a rapidly growing company that has embraced Microsoft Azure to scale the customer-facing website directly to end-users to allow them to create self-service tickets and track technicians. The company also uses an on-premises ASP.NET Model–View–Controller architecture for its customer service representatives to administer customer orders. HealthNet development manager Mr. Kamal has decided to implement a pilot project using the DevOps features of Microsoft Azure DevOps to bridge the gap between what they have today and what they can benefit from in

Microsoft Azure DevOps. HealthNet will migrate all its development to the Microsoft Azure DevOps platform if the pilot is successful. Mr. Ali and Mr. Abu (the IT manager) have decided to use Scrum as the preferred project management method. The developers agree on using XP practices to enhance the quality of the software and increase business value to the company.

The Pilot Project
The HealthNet project has decided to use as a pilot for the DevOps implementation as an expense-reporting application (HealthNet Expense Reporting). In the early days, expenses were handled easily by the administrative staff, but because the company has grown quickly and salespeople are located and traveling all over Malaysia, things have become a bit more complicated. The admin staff members want an application that will make their jobs easier and at the same time make sure employees get reimbursed for expenses quickly. Because this project will be using Scrum as a project management process, Mr. Kamal and Mr. Abu have appointed Mr. Amir as the product owner for the application. Mr. Amir has only been working for HealthNet for six months. He is experienced as a product owner for this pilot study because his previous employer used Scrum extensively. Important stakeholders for the project are Mr. Abu, Mr. Kamal, and Mr. Ahmad. Mr. Ahmad is a manager for the admin department and will represent the end-users as well as the admin organization.

Starting Work
The idea for this project started when HealthNet noticed that bug fixes in the expense reporting system created new bugs and that the new bugs sometimes appeared in parts of the system considered not to be affected by the original bug fix. HealthNet soon realized it lacked traceability and had no way of knowing where a bug fix might have its impact in addition to the actual code change. Mr. Amir has just attended a conference and has added to his already considerable knowledge of DevOps, Agile concepts, and Azure DevOps. He comes up with the idea of getting a better grip on the DevOps process and, at the same time, starting using Agile practices at HealthNet. Both efforts would greatly improve things at HealthNet. At the same time, Mr. Amir sees that collaboration between two developer teams could improve if they use Azure DevOps. Mr. Amir writes a business case and presents it to the management team. After a few discussions, they agreed to a pilot project. Because the expense-reporting project is in the pipeline, upper management decides to use it for the pilot.

User Stories
1. As a salesperson, I want to manage expense reports over the Internet so I can be more efficient.
2. As a manager, I want to search for expense reports so I can get an overview of expenses more easily.

From the case study, please answer the following questions:

a.   Identify and explain at least **FOUR (4)** problems that lead to the adoption of DevOps for HealthNet.   **[5 marks]**

b.   The adoption of DevOps best practices will help to align people and progress towards organizational goals. DevOps offers multiple process frameworks at

every stage of software development. Please identify and apply **TWO (2)** processes in DevOps and describe in detail related to the HealthNet.

    i.   Build Management   **[5 marks]**
    ii.   Release Management   **[5 marks]**

c.   Continuous integration (CI) and continuous delivery (CD) are popular and valuable processes to ensure high-quality and timely software delivery. Continuous integration is the integrated software development process where multiple developers adhere to the agile methodology while Continuous delivery is the process of extending the continuous integration. Please answer the following questions:

    i.   Identify and apply at least **FIVE (5)** best practices of CI/CD for HealthNet.   **[5 marks]**

    ii.   Analyze at least **FIVE (5)** advantages and disadvantages of the GitLab and Jenkins tools for DevOps adoption to HealthNet.
                                                    [5 marks]