SULIT

TAKE HOME EXAMINATION: FINAL EXAMINATION
SESSION 2020/2021, SEMESTER 1

SUBJECT CODE : **SCSJ 3323**

SUBJECT NAME : **SOFTWARE DESIGN AND ARCHITECTURE**

YEAR/COURSE : **3 SCSJ**

TIME : **5 HOURS**

DATE : **8th February 2021**

SECTION A: Structured Questions **(40 Marks)**
SECTION B: Essay / Problem Solving **(60 Marks)**

TOTAL: **100 MARKS**

INSTRUCTION AND REMINDER

Answer all questions in the given answer sheet All diagrams must be drawn using the UML diagram drawing tools. Note that any form of plagiarism will cause students to get zero in this assessment. Submit the assignment via e-Learning or as instructed by the course lecturer. This examination contributes 35% marks from the whole course assessments.

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This exam consists of NINE (9) pages excluding this page.

SECTION A - STRUCTURED QUESTIONS

INSTRUCTION: Answer all the following FOUR (4) questions.

The following is the description for **CCTU Travel and Tour case study**. This case study will be used throughout questions A1-A4.

Question A1 **(10marks)**

a. PDL (Programming Design Language) popularity stems from the use of natural languages—as opposed to computer languages or graphical techniques—to define the required behaviour of functions. Based on the case study of CCTU Travel and Tour, write up a PDL to represent the flowchart given in Figure A-1 given in the case study.

(4 marks)

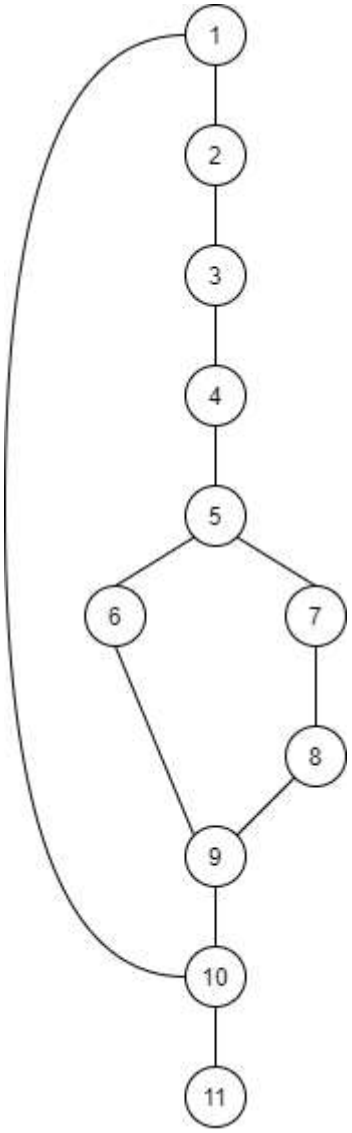
b. The cyclomatic complexity computation allows designers to measure the complexity of flow-based operational designs by determining the complexity of the decision structure of operations instead of lines of code. Based on Figure 1, convert the codes to draw the program flow Graph and determine the cyclomatic complexity using 2 different calculations.

```
#include <iostream>
using namespace std;
int main()
{
 char repeat;
 int passenger;
 int age;
double tickectprice;
 do
 {
     cout<<"Please insert the number of passenger(s)"<<endl;
     cin>>passenger;
     tickectprice=0.00;
     for (int a=1;a<=passenger;a++)
     {
      cout<<"Please insert the age for passenger no "<<a<<endl;
         cin>>age;
         if (age<0 || age>100)
         {    cout<<"Please insert the age for passenger no "<<a<<endl;
         cin>>age;
}
         if (age<15)
         {cout<<"Underage is not allowed for this ride. You need to re-
enter again the no. of passenger"<<endl;
         break;}
         tickectprice+=25.00;
     }
     cout<<"Would you like to add passengers? if yes please press
y"<<endl;
     cin>>repeat;
 } while (repeat=='y'||repeat=='Y');
 cout<<"The total price for the ride is RM "<<tickectprice;

      system("pause");
      return 0;}
```

Figure 1

(6 marks)



Region : 3

First method :

V(G) = e –n + 2p

e = 12, n = 11, p = 1

V(G) = 12 - 11 + 2(1) = 3

Second method :

C = π+ 1

π = 3 – 1 = 2

C = 2 + 1 = 3

Question A2 **(10 marks)**

a. Based on the case study CCTU Travel and Tour case study, draw an EEDT (Extended Entry Decision Table) for decision on tour cancellation. Give an excerpt of the code for the implementation of the EEDT.

Question A3 **(10 marks)**

a. An important outcome of the planning stage is to have a clear understanding of the roles that each staff member plays in the process of completing each element of the WBS (Work Breakdown Structure). From your experience in Project 1 with your team members, draw a WBS linear responsibility chart to show distribution of task for development of overall modules of CCTU Travel and Tour case study.

(4 marks)

b. Similar to Gantt charts, network diagrams are also graphical representations of logical flow between tasks, describe task durations, and need the same three basic parameters: Tasks, Tasks durations, and Predecessors and successors. Based on Table 1, draw an Active-on-nodes Network diagram and calculate expected times computed from every path discovered and determine which path is the critical path.

Table 1

Outline	**Time(days)**			
	Minimum	**Most likely**	**Maximum**	**Immediate Processors**
1.1 Conduct Interviews	2	2	8	None
1.2 Administer Questionnaires	2	3	8	1.1
1.3 Read Company Reports	2	3	8	None
1.4 Analyse data flow	3	7	15	1.2, 1.3
1.5 Introduce prototype	3	5	8	1.2, 1.3
1.6 Observe reactions to prototypes	1	2	9	1.5
1.7 Perform cost benefit analysis	1	2	9	1.4
1.8 Prepare proposal	2	2	8	1.6, 1.7
1.9 Final review on proposal	2	2	8	1.8
1.10 Present Proposal	2	2	8	1.9

(6 marks)

Question A4 **(10 marks)**

a. You are managing a software design project for the given case study composed of 20 tasks. Each task was estimated to cost $500; therefore, BAC = $10,000. Each task was estimated to be completed in two months; therefore, the total planned duration for the project was estimated to be 40 months. Since each task is expected to have the same cost and duration, the completion of an individual task represents 5% completion of the design project. In the current fifth month, only three tasks have been fully completed at a cost of $5,000. You need to provide upper management with current progress status.

Earned Value Management (EVM) is a project management technique to determine the progress of tasks based on the value of the work currently completed versus the work that was expected to be completed at that particular time. Based on the situation above, show the implementation of the EVM equations in order for you to explain to the upper management.

Parameter	**Calculation**
EV	(% work completed) x planned cost for the work (3/20) x 10,000 = 1,500
CV	EV – AC 1,500 – 5,000 = -3,500
SV	EV – PV (5/40 x 10,000) 1,500 – 1,250 = 250
CPI	EV / AC 1,500 / 5,000 = 0.3
SPI	EV / PV 1,500 / 1,250 = 1.2
ETC	(BAC - EV) / CPI (10,000 – 1,500) / 0.3 = 28,333.3333
EAC	ETC + AC 28,333.3333 + 5,000 = 33,333.3333

The result show that the project is over budget and ahead of schedule because CPI is 0.3 and less than 1 and SPI is 1.2 and more than 1.

(6 marks)

b) Leadership plays a key role in the success or failure of complex projects. There are **FOUR (4)** keys in leadership skills. Based on your own experience, explain how do you apply **TWO (2)** keys in leadership skills during your project in this course**.**

(4 marks)

TWO (2) keys in leadership skills applied during the project in this course

1. Communication : Throught the project , communication play the big role in every aspect . First, I establish a good releationship with all my teammate. Then, we will discuss together on what to do. I will try to understand first on the task and communicate with them and explain on how to do. I will make sure each of them understand on that task given before we distribute the task. Lastly, during the progress of work, I will ask each of them on how the progress and if they understand or not. I also tried my best to help them through the project.

2. Motivation : I always motivate them and myself on why we have to finish the project successfully. Sometimes, they feel like cannot do it because the task seem hard, but I motivate them with asking the progress and tried to help them in the part that they stuck to do it.

SECTION B - ESSAY / PROBLEM SOLVING

INSTRUCTION: Answer ALL of the following questions based on the provided case study

Question B1 **(30 marks)**

Please answer the following questions based on the **MediNET System Description document**. The following questions describe the additional requirements that require you to apply the suitable design patterns. Each of the following questions does not relate to each other. In your solution (Class Diagram), only draw the modified classes in the existing Package. You do not have to include or redraw all Classes from the Package.

a) Based on Figure 2-2 in Section 2.2.1, Registration package, ConsultationQueue and PatientInQueue are two classes that deal with the implementation of a queue for patient consultation. ConsultationQueue items are the objects instantiated from PatientInQueue class, which is an inheritance from the Patient class. PatientInQueue class has three additional attributes i.e. arrivalDateTime, queueNumber, and doctorID. Apply singleton design pattern for the implementation of queueNumber which will be shared among all the PatientInQueue objects to show position in a queue to a patient, add also methods to add or remove the patient from the queue if the patient is in queue for treatment or leave the queue after treatment.

(10 marks)

b) i. Figure 2-1 in Section 2.1 shows the current packages in MediNET, This system will be expanded where there will be a website portal being developed to provide a one stop center for patient to pay for bills online, search for offered services offered by different health care provider and conveniently make payment online. Apply Façade design pattern which include suitable methods in the interface class WebPortal to enable the link from façade to the three new subsystems.

(5 marks)

ii. Write a code excerpt for the implementation Façade design pattern in (b) i. to show how the design pattern work in integrating or linking the different subsystems.

(5 marks)

c) Based on the class diagram in Figure A-5 in Section 2.1.1 of Registration package, it describe the relationship of a Patient class with the ConsultationQueue and PatientInQueue. There are no specified traversal method for both ConsultationQueue and PatientQueue, It would be more efficient if there is a specified traversal method such as identifying the next patient, get the position of the current patient and identifying how many more patients left for both types of queues. Select a suitable design pattern that may provide a standardized way for accessing and traversing these different types of collections and draw the related class diagram..

(10 marks)

Question B2 **(30 marks)**

Please answer the following questions based on the Hotel Ayu Villa System Description document. The following questions describe the additional requirements that require you to apply the suitable design patterns. Each of the following questions does not relate to each other. In your solution (Class Diagram), only draw the modified classes in the existing class diagram. You do not have to include or redraw all Classes from the class diagram)

a

i. Based on Figure 2-3 in Section 2.1.1 of Hotel Booking, there are various types of rooms offered for booking and for every room there are different types of utilities provided for the customer of Hotel Ayu Villa. Create suitable classes to represent the rooms for booking, apply Abstract Factory Design Pattern for the creation of different objects for different variants of rooms with its different utilities.

(6 marks)

ii. Describe two (2) justifications for how the above solution helps to improve the quality of hotel booking in Ayu Villa Hotel.

(4 marks)

b) Based on Figure 2-5 in Section 2.1.3 of the Hotel Ayu Villa System Description document), the development team has identified different categories of Staff employed by Hotel Ayu Villa as shown in Figure 2. This information is useful for a new class, which is class Department to list all of the staffs suitable in the department. A staff is considered as a primitive item while the Department is considered as composite item where the staff can be sub item of another staff in the Department class. Suggest the most suitable design pattern that supports the primitive and composite classes to represent the design pattern.

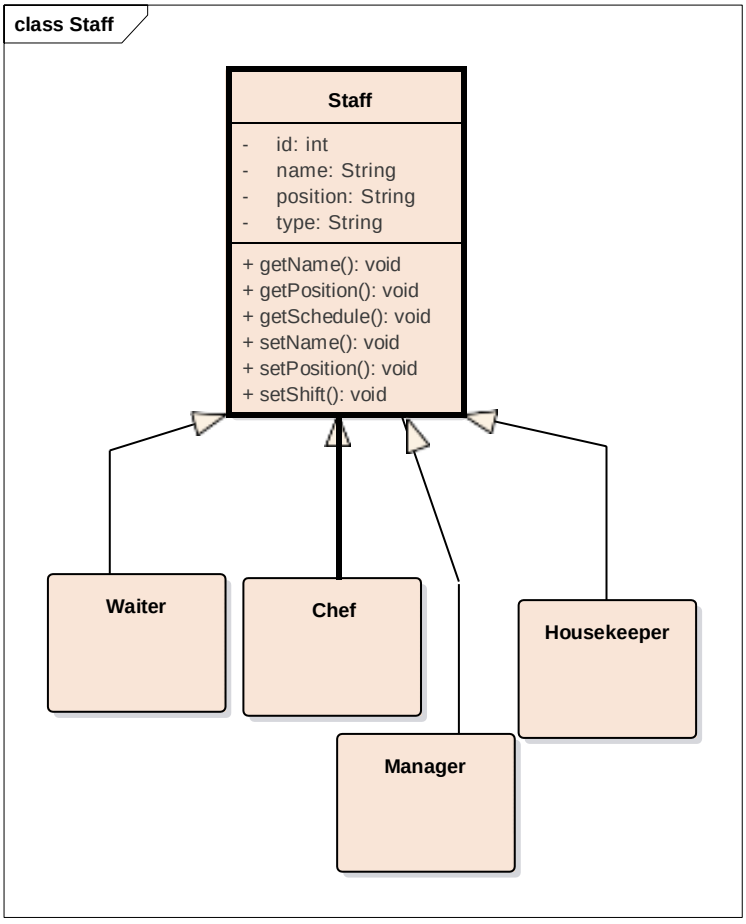


Figure 2

(10 marks)

c) Hotel Ayu Villa always wants to observe complaint they get from their customer. Therefore, the system should notify the Hotel, travel agencies and staff on the complaint they get from the customer based on the services they offered either in the form of packages, types of rooms and

other facilities offered to the customer. Based on Figure 2-6 in section 2.1.4 of Customer Service, two classes, Complaint and Service should be modified with a suitable design pattern to enable an effective observation and notification between the two classes.

(10 marks)