Beijing-Dublin International College

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SEMESTER II FINAL EXAMINATION - 2016/2017
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FACULTY OF INFORMATION (School of Software Engineering)

MODULE COMP2001J: SOFTWARE SYSTEMES ARCHITECTURE

HEAD OF FACULTY OF INFORMATION: Junfei QIAO
MODULE COORDINATOR NAME*：Zhang Jian

Time Allowed: 95 minutes

Instructions for Candidates

All questions carry equal marks. The distribution of marks in the right margin shown as a percentage gives an approximate indication of the relative importance of each part of the question.

BJUT Student ID: _____   **UCD Student ID:** _____

I have read and clearly understand the Examination Rules of both Beijing University of Technology and University College Dublin. I am aware of the Punishment for Violating the Rules of Beijing University of Technology and/or University College Dublin. I hereby promise to abide by the relevant rules and regulations by not giving or receiving any help during the exam. If caught violating the rules, I accept the punishment thereof.

Honesty Pledge： _____ **(Signature)**

Instructions for Invigilators
Non-programmable calculators are permitted.
No rough-work paper is to be provided for candidates.

Obtained score

Question 1: Fill in the Blank (30 Points, 1 Point Per Each Blank)

1. Designed and developed by the professional engineering specialists, a software system/application is referred as to a product that delivers computing device potential, and is the logical & structural organization of _____;

2. Software Architecture – is a meaningful representation of design concept and a modelling blueprint for the software product that is to be built, is a skeleton plan of _____ and the decision of _____, embodied in its components (building blocks, parts, and structural elements):

   -- A decision on the division of _____;

   -- A design specification to guide and aid in the following step of software procedures;

3. Issues faced by software building: 1) a software is complex; 2) a software is uncertainly developed; 3) a software is long life-cycle, high-cost, poor-quality; Software architecture design is one of the most fundamental techniques and the most important procedure, bridging the gap between software's _____ and system implementation (coding).

4. Software Product/System's production-line manufacturing: adapts a production-line of software products, i.e. by means of _____, standardized specification and behaviour code to develop and implement the software's_____ that exposes to all kinds of application scenario, such a pattern is used to deploy the components into the open framework, to composite into the expected products

5. The design methodology of software architecture evolves from the following stages:

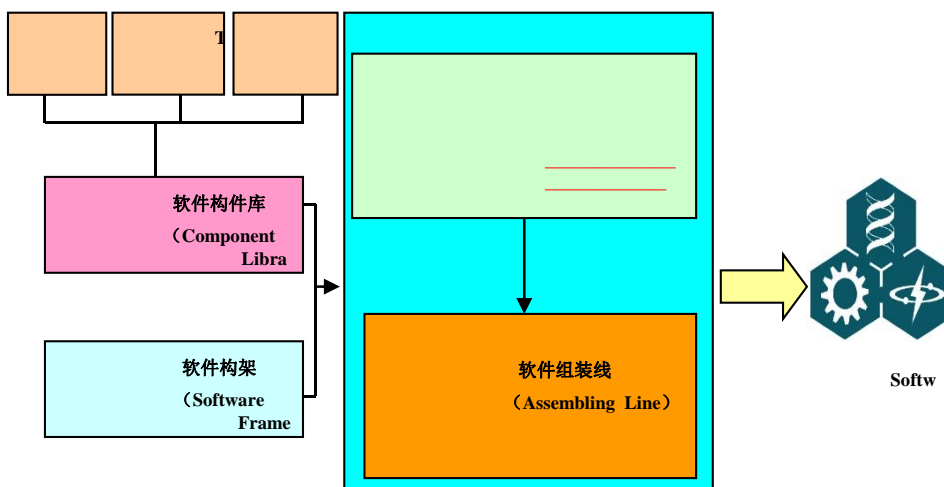   -- Functionality program design;

-- Structure program design;

-- _____

-- _____

-- SOA program design.

6. Modern software production is depicted as the following diagram, fill the blank in the name
    of related item _____ in the textbox.

7. The connecting topologies among the components are depicted as the below diagram, in
    figure A, the connecting mechanism is called as software architecture with _____
    connecting while in figure B, the connecting mechanism is named as software architecture
    with _____ connecting.
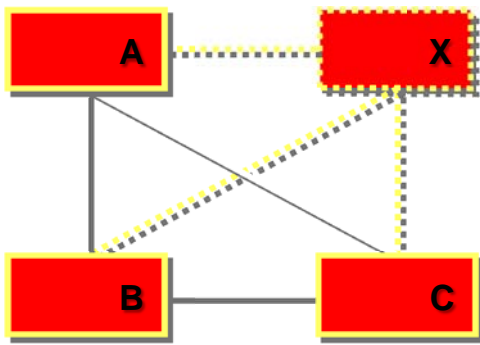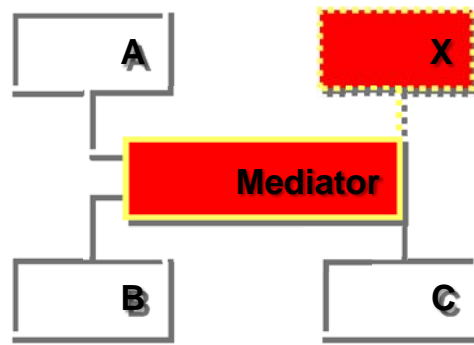
Figure　　　　　　　　　　　　　　　　**Figure**

8. Software Design Style – reflects the connecting and organizing mechanism of components, different kinds of software style includes _____, _____, _____, _____, _____.

9. Evaluation & Analysis of Software Architecture – review on design documents, design procedure, code, and implementation procedure, to detect _____ of software, promote the quality of software, and _____ ahead of the disaster caused by error of design, and choose the better one or _____ design.

10. Quality attributes of a software system covers multi-categories, ranging from usability,_____, _____, _____, _____, _____,testability, ease of creation, transplantability, integratability) .

11. Graphic representation is a simple and a widespread of tool for software architecture representation, within this scope, Rectangle items (with arrow, without arrow, with solid-arrow, with dash-arrow, ….) is used as the model notation of component and _____.

12. Graphic User Interface (GUIs): is an interactive interface between the user and the computer models, GUIs offer the user user-friendly, ease-use, helpful media to the end users: Generally　　speaking,　　GUIs　　are　　characterized　　by　　the

_____,_____,_____ items etc..

Obtained score

Question 2: True/False Choice (10 Points , 1 Point Per Question, If Choice of True, Fill√ in the Blank; If Choice of False, Fill X in the Blank)

1. Software architecture is not only the representation and modelling description of software system/application, but also the runnable software application(   );

2. Within the scope of structural software architecture design, the entry point of principle component is a main () function (   );

3. N-Tiers software architecture style is referred to as a structure of software system components, each layer will offer interactive service for the above layer, and non-neighbouring layers will not interoperate (   );

4. In software architecture, middleware component will not be allowed (   ).

5. The style and patter of a software architecture can be applied to the scenario of design for other software systems (   );

6. In the field of designing software architecture with object-oriented analysis and design method, the fundamental units of a system is the functions (   );

7. The method of representation and description of software architecture includes formal and informal approaches: UML is an informal method while ADL is a formal one (   ) ;

8. With the design method and approach of distributed software architecture, it's possible to implement inter-connecting, interactive and interoperating among the components of heterogeneous platform (   ) ;

9. The evaluation and analysis methods of software architecture include SAAM, ATAM and ARID etc… (   );

10 In MVC patterns, there are presentation layer, model, and controller modular(   );

Obtained score

Question 3: Question and Answer (20 Pints, 5 Points Per Question)

1（5 points）What's software architecture? Describe the principle content and fundamental

   elements.

2（5 points）What's the distributed software application? Describe the benefits and

shortages of distributed software architecture patterns.

3（5 points）Describe the software architecture connected by the middleware container with

the demo diagram.

4（5 points）Describe the roles and tasks of a component in software architecture.

Obtained score

Question 4: Programming of Design and Coding Comprehension (20 Points, 5 Points Per Question)

1（5 points） Design and implement the software architecture of a software application with

4-tier pattern, including client-side layer, presentation layer, business logic layer, and data

resource management layer by using MFC VC++/Java/C#/C programming language. You are

request to describe the components of each layer and call procedure.

2（5 points）A CRC （Component Responsibility Card） is depicted as follow , you are

required to implement the specification of the card by using C/ C++/C# or Java programming

language.

component name: Rocket	
super classes:	
subclasses:	

Responsibilities
 	
1 Take charge of describing basic attributes,
        InitInstance, Launch, Fly, ExitInstance,….
        of A Rocket
 	
Model
	Collaborators
	
	    class Rocket_Display

Attributes	class Rocket_Display
int H, V	{
int x, y, z,	Rocket_Display()
Responsibilities	{

C Rocket(CRocket_Display rocket); // Constructor
 	
void DrawRocket ( ) ;   // Drawing Rock
 	
void InitInstance();   // Initial handling
 	
void ExitInstance ();   // exiting handling
 	
void Launcher();   //Launching handling
 	
void Fly();   // Flying handling
 	
……..
	}
	    ….
	}
	…..

3（5 points）The software architecture of an application system is depicted as follows, write the results of running the application with Java programming language.
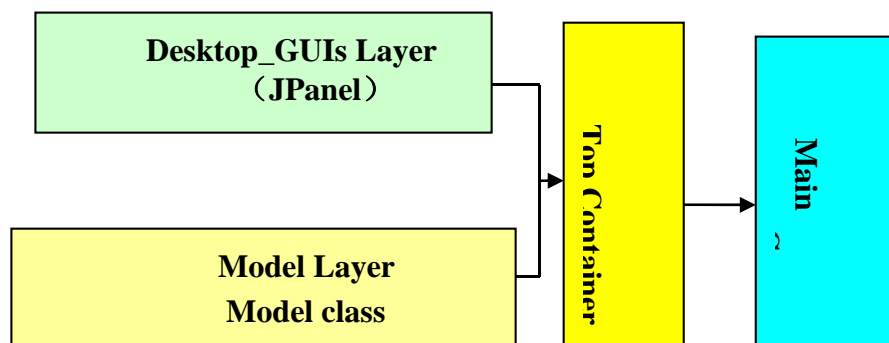
class Exam_App {

```java
   public static void main() {

    new Exam_Frame();

  }

}

class Exam_Frame  extends  JFrame {

  Container contentPane;

  Display display;

  Model model;


  Exam_Frame() {

    contentPane = this.getContentPane();

    display = new Display();

    model = new Model(display);

    setSize(1024,768);

    setVisible(true);

  }

}

class Display {

  BufferedImage buffer = null;

   …

  Display()

  {

    buffer = new BufferedImage(1024,768, BufferedImage.TRANSLUCENT);

  }

  public void paintComponent(Graphics g)

      {

              g.drawImage(buffer,0,0, null);
```

```
        }

        …

}

class Model

{

    BufferedImage image;

    Graphics g;

    Display panel = null;

    Model( Display pane)

    {

        this.panel = pane;

        g = panel.buffer.getGraphics();

        g.drawString("I am participating the final exam of Software Systems Architecture " , 10 , 10);

        g.drawString("I will Success!!" , 10 , 50);


    }

    …..

}
```

The results are:

4（5 points）The software architecture (time-sequence diagram)of a VC++ MFC

application program is described as follows, please complete the code in the blank

according to the requirement. Exam_App component as a main component is used to

assembly the GUIs component: Exam_Dlg; GUIs component as a visual user interface

is used to call and capture the data from the Model component: Model, via a function:

Model_Display）.
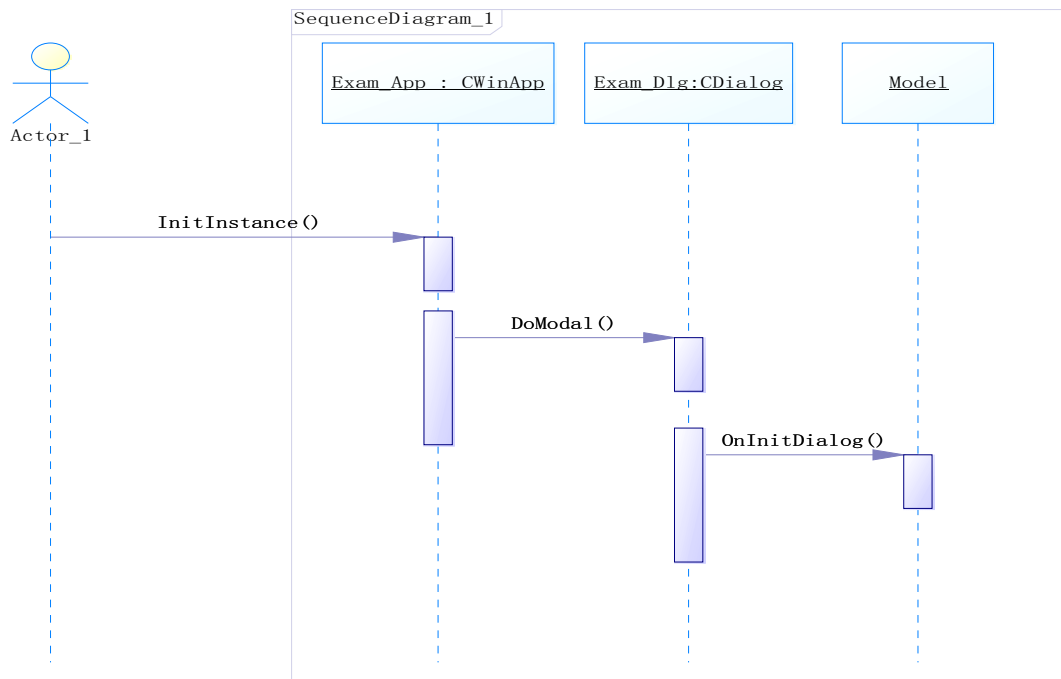
#include<afxwin.h>

class Exam_App : CWinApp

{

  public:

    virtual BOOL InitInstance();

};

Exam_App app;

class Exam_Dlg: CDialog

{

  Public:

    Model *model;

  public:

```
    void OnInitDialog();

    void Model_Display();

};

class Model

{

  public:

    Model();

    String model_data();

};
```

Giving and coding the function: Model_Display in class Exam_Dlg, in which

   Model_Display call and return data from model_data() in class Model.


```
void Exam_Dlg::OnInitDialog()

{

 // Giving and coding the pointer to the class Model;


}

void Exam_Dlg::Model_Display(){
```

// Giving and coding the procedure of calling and returning the data from String

   model_data() in the class Model.

}

Obtained score

Question 5:
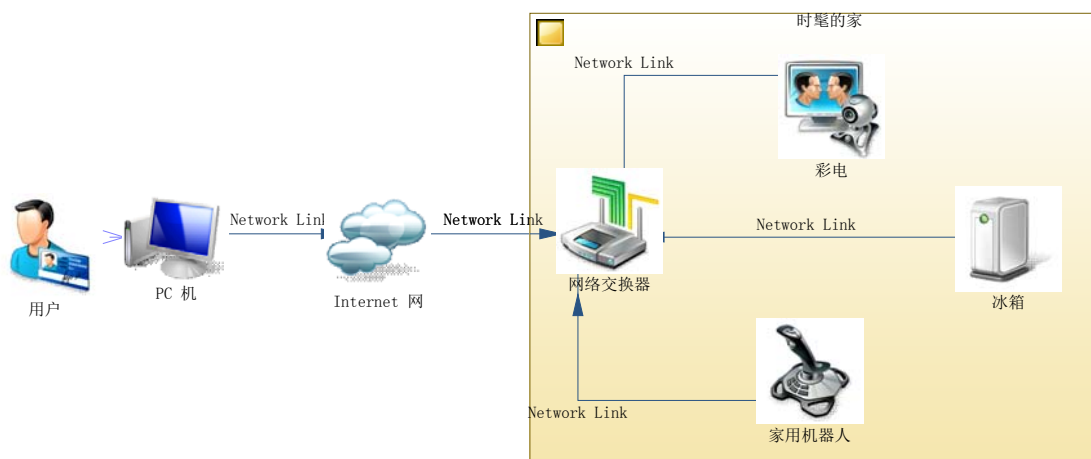
1 （10 points）The software architecture of pipeline-filter style application is depicted as the diagram, A::A_Fun, B::B_Fun，C::C_Fun，D::D_Fun represent the function of A，B，C，D（input / output is string type, S as an original input String, and O as a final output result String.
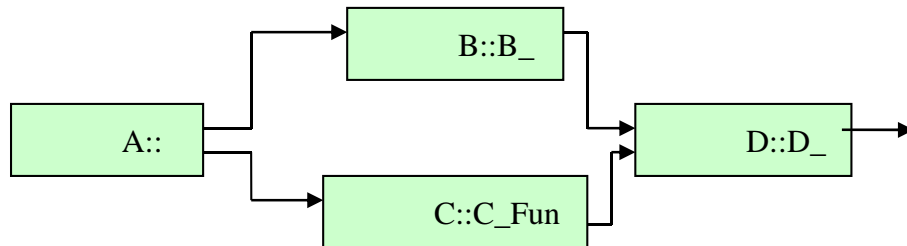
(1）Coding the components A, B, C, and D by C, or VC++ MFC, or Java programming

   language

 （2）Design the software architecture, including a main component to assemble the

   component A, B, C, D）

2 （10 points）A Smart Home is depicted as the following diagram

A user could utilize the PC Desktop as the terminal, to remotely control the TVSet, Refrigerator, Home Robotics etc. via Internet. You are required to design the software architecture of a software system, which could control the TVSet, Refrigerator, HomeRobotic etc.

(1) Design a software architecture for the software application that control the condition of the TVSet, Refrigerator, HomeRobotic from the remote pc desktop. You are required to include the system-level's module, component-level's components such as TVSet, Refrigerator, HomeRobotics components);

(2) Using VC++ MFC or Java programming language to implement and coding the design of above system;

(3) In the environment of VC++ MFC or Java programming language, design and implement an assembly line, to assembling the components into the system.

Appendix :