Semester One of Academic Year (2015---2016) of BDIC

<<Software System Architecture>>

Module Code: COMP3029J

Resit Exam Paper

Exam Instruction: Answer ALL Question

Honesty Pledge:

I have read and clearly understand the Examination Rules of Beijing University of Technology and University College Dublin and am aware of the Punishment for Violating the Rules of Beijing University of Technology and 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 would accept the punishment thereof.

Pledger: _____ **Class No.:** _____

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

Notes: The exam sheet covers 5 type of questions, and 12 pages, totally 100 points. During the exam, please use the attached answer sheet and scratch sheet to answer the questions

Exam Sheet Score Collecting Table (Teacher only)

No.	一	二	三	四	五	六	七	八	Total Score
Full Score	30	10	20	20	20				
Score									

(Score)

一、 Fill in the Blank (30 Points, 1 Point Per Each Blank)

1. Software Architecture – is a meaningful representation of design concept and a modeling 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 Procedure
2. Designed and developed by the professional engineering specialists, A software is referred as to a product that delivers computing device potential, and is the logical & structural organization of _____ .
3. MFC VC++ Development Environment give the fundamental tools and libraries of Windows-based application development, providing the well-defined patterns of interfaces that can be utilized by the developer: the developer's tasks are embedding and fitting the component into the pattern of the Microsoft Visual C++; The tools offerred by MFC VC++ include
   AppWizard (used to produce the pre-defined pattern application and files) ,
   _____ (used to produce the GUIs items) ,
   _____ (used to add the component and member function into the project
4. In the VC++ MFC development environment, for the purpose of developing a window-based application, it's an important and essential step to include a main component as a assembling line, which will inherited from the MFC super class _____.
5. Software Product/System's product-line manufacturing: adapts a product-line of software products, i.e. by means of _____, standardized specification and behavior 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
6. The design methodology of software architecture evolves from the following stages:

-- functionality program design;

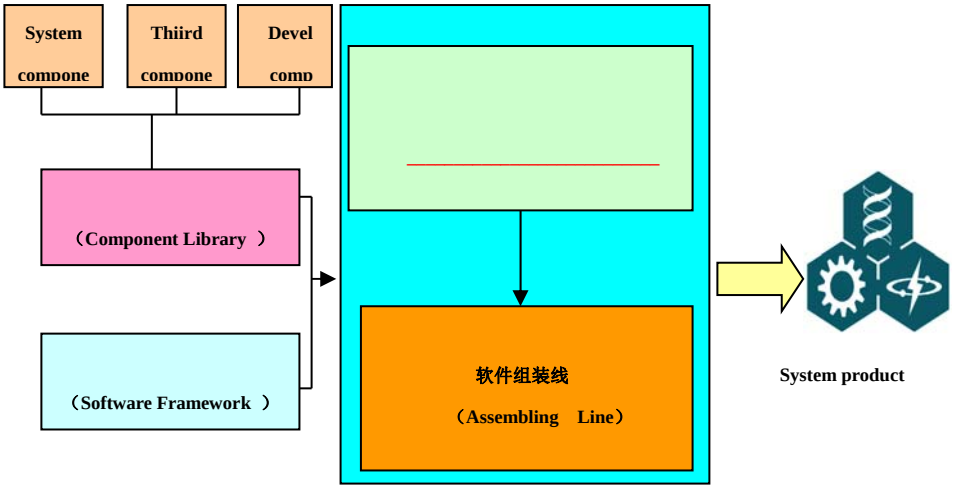
-- structure program design;

-- _____;

-- _____;

-- SOA program design.

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



8. 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.

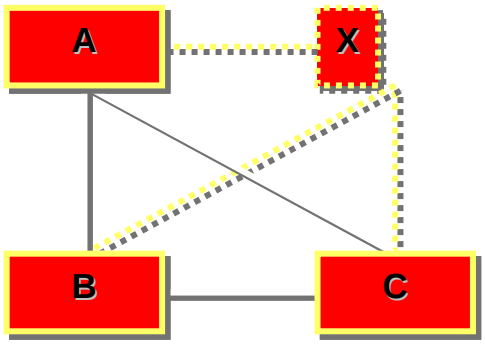


Fig. A

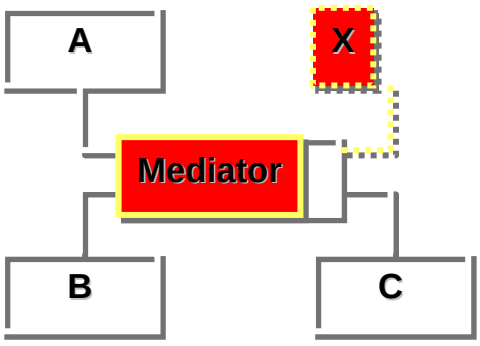


Fig. B

9. Software Style – reflects the connecting and organizing mechanism of components, different kinds of software style includes _____, _____, _____, _____, _____ ;
10. Evaluation & Analysis of Software Architecture – review on design documents, design procedure, code, 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;
11. Quality attributes of a software system covers multi-categories, ranging from usability, _____, _____, _____, _____, _____,testability, ease of creation, transplantability, reusability, integrability.
12. 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 _____.
13. 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..

Score

二、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. Data flow diagram is a graphic representation approach for software architecture, which is used to describe the procedure of data flow and data transferring. The used graphic elements include transformation/processing, data flow, data-storage, and entities etc. ( ).
2. Within the scope of structural software architecture design, the entry point of principle component is a main() function ( ).

3. All of the connector and connecting mechanism in software architecture is based on the Message-Driving design style ( ).
4. Software architecture is not only the representation and modeling description of software system/application, but also the runnable software application( ).
5. N-Tiers software architecture is referred to as a structure of software system components, each layer will offer interactive service for the above layer, and non-neighboring layers will not interoperate ( ).
6. The style and patter of a software architecture can be applied to the scenario of design for other software systems ( ).
7. In the field of designing software architecture with object-oriented analysis and design method, the fundamental units of a system is the functions ( ).
8. 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 ( ).
9. In the procedure of building a software system, we could only use one kind of software design style or design pattern.( ).
10. The evaluation and analysis methods of software architecture include SAAM, ATAM and ARID etc. ( ).

Score

三、Question and Answer （20 Pints, 5 Points Per Question)

1 （5 points）Give a brief description of designing the approach of the GUIs software architecture within MFC VC++ or Java development environment.

2 （5 points）What's software architecture? Describe the principle content and fundamental elements.

3 （5 points）Describe the software architecture style of pipeline & filter pattern.

4 （5 points）What's the distributed software application? Describe the benefits and shortages of distributed software architecture patterns.

Score

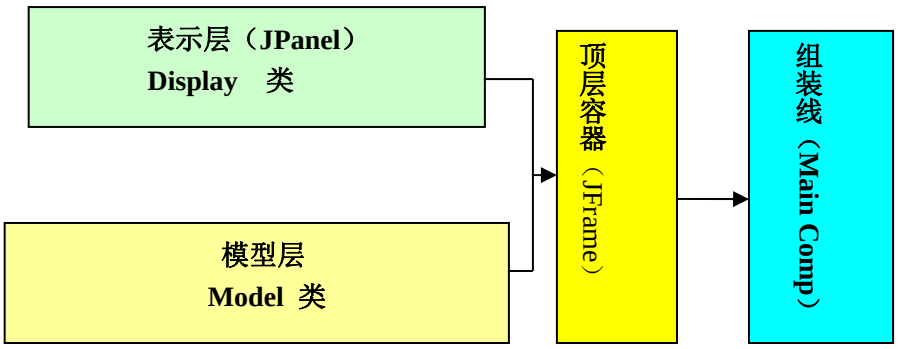
四、Programming of Design and Coding Comprehension （20 Points, 5 Points Per Question）

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. 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, use C/ C++ or Java programming language to fulfill the content of the above CRC.

<table>
<tr><td colspan="2">component name: CRocket</td></tr>
<tr><td colspan="2">super classes:</td></tr>
<tr><td colspan="2">subclasses:</td></tr>
<tr><td>Responsibilities
1 Do actions of describing the basic attributes, states of a CRocket such as InitInstance, Launching, Flying, …..</td><td>Collaborators
CRocket_Display</td></tr>
<tr><td>Attributes</td><td rowspan="5">class CRocket_Display
{
CRocket_Display()
{
}
….
}
…..</td></tr>
<tr><td>int H, V
int x, y, z,</td></tr>
<tr><td>Responsibilities</td></tr>
<tr><td>CRocket(CRocket_Display rocket); // Construction
void DrawRocket（）; // Drawing
void InitInstance(); // InitInstance
void ExitInstance (); // Exit
void Launch(); //Launching
void Fly(); // Flying
……..</td></tr>
</table>

3(5 points)The software architecture of an application system is depicted as follows, write the results of running the application .

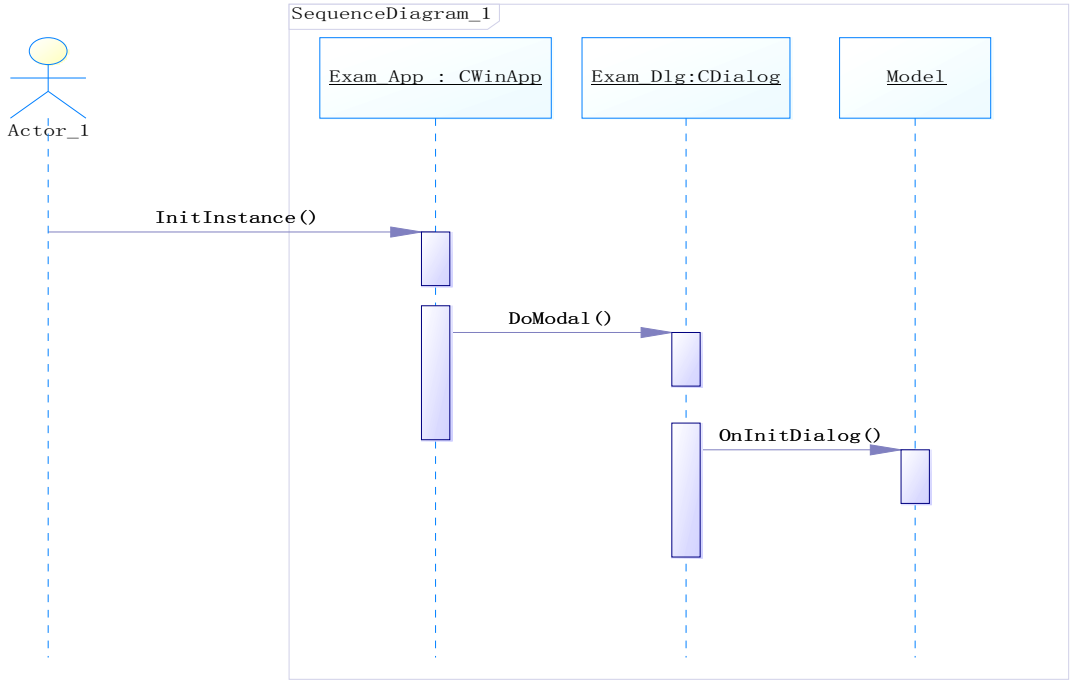



```
class Exam_App {
  public static void main() {
    new Exam_Frame();
  }
}
class Exam_Frame  extends  JFrame {
  Container contentPane;
  Display display;
  Model model;

  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 test of Software System Architecture ”, 10, 10);
       g.drawString(“I will Success!!”, 50, 10);

   }
   …..
}
```

The results:

4（5 points）The software architecture of a VC++ MFC application program is described as follows, please complete the code in the blank according to the requirement）




```
#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();
};
```

Please write down the code: In an object Exam_Dlg, Model_Display call String model_data() in an object Model:

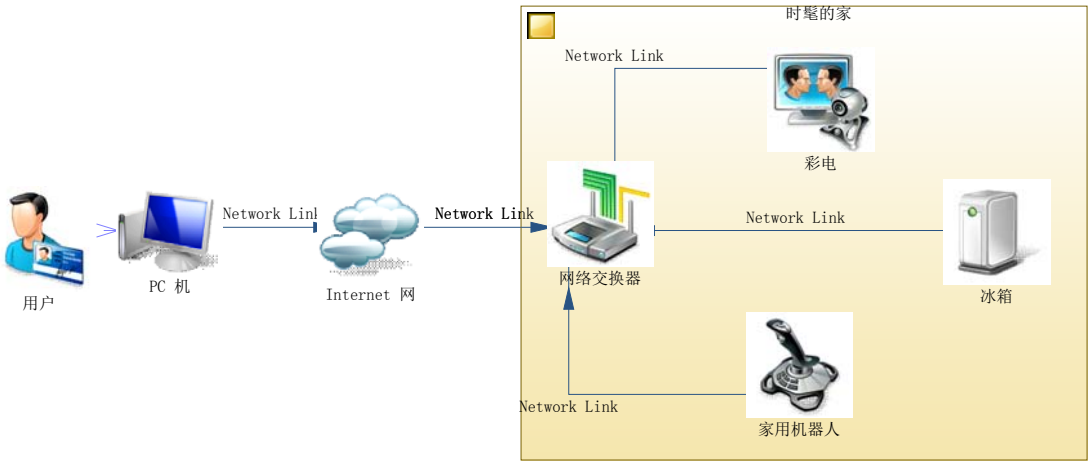
```
void Exam_Dlg::OnInitDialog()
{
 // write down the code:  a pointer to the Model



}

void Exam_Dlg::Model_Display()
{
// write down the code:  call the function: String model_data()




}
```

Score

五、Comprehensive Designing & Programming Application

（20 Points, 10 Points Per Question）

1 （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 component);

（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.

2 （10 points） E-Schoolbag is a Web-based distributed application system, including client-end, server-end and data resource administration-end, in which the user acquire the e-textbook of Word or PDF type. Design the software architecture such as

（1） (Design the software architecture, including client-end layer, Web service

layer, data resource layer, by using graphic representation methods;

(2) Describe the technical reference model;

(3) Coding the component of each layer, at least, write down the function of each component.