所別：資訊管理學系碩士班 甲組 科目：計算機概論
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1. (10 points) "downcast" is needed in polymorphism:
   i. When should it be used? (3 points)
   ii. Why it may cause run-time exception if not used properly? (3 points)
   iii. What technique should be used to avoid potential run time error during downcasting ? (4 points)

2. (5 points) What is design pattern, and why it is important in software engineering?

3. (10 points) The following code is all in one file "Sandwich.java". Please identify the output of executing its compiled program using command "java Sandwich" from answers (a) to (e), which are listed after the code.

```
// begin of Sandwich.java
class Utensil {
    String utensilName;
    Utensil() {System.out.println("Utensil()");}
    Utensil(String name){
        utensilName = name;
        System.out.println("Utensil("+utensilName+")");
    }
}
class Meal {
    Utensil u;
    Meal() {
        System.out.println("Meal()");
    }
    Meal(String utensilName) {
        System.out.println("utensil name = " + utensilName);
        u = new Utensil(utensilName);
        System.out.println("Meal("+utensilName+")");
    }
}
class Bread{
    Bread() {System.out.println("Bread()");}
}
class Cheese{
    Cheese() {System.out.println("Cheese()");}
}
class Lettuce{
    Lettuce() {System.out.println("Lettuce()");}
}
class Lunch extends Meal {

    Lunch() {
        super("anUtensilForLunch");
        System.out.println("Lunch ()");
    }
    Lunch (String utensilName) {
        super(utensilName);
        System.out.println("Lunch("+utensilName+")");
    }
}
class PortableLunch extends Lunch{
    PortableLunch () {
        super("anUtensilForPortableLunch");
        System.out.println("PortableLunch ()");
    }
    PortableLunch (String utensilName) {
        super(utensilName);
```

注意：背面有試題

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```
        System.out.println("PortableLunch("+utensilName+ ")");
    }
}
public class Sandwich extends PortableLunch {

    Bread b = new Bread();
    Cheese c;
    Lettuce l = new Lettuce();

    Sandwich() {
        System.out.println("Sandwich()");
    }
    Sandwich(String utensilName) {
        super(utensilName);
        System.out.println("Sandwich(" +utensilName+ ")");
    }
    public static void main(String[] args) {
        System.out.println("Begin");
        Sandwich y = new Sandwich("smallFolk");
        System.out.println("End");    }
}
// end of Sandwich.java
```

Possible output:

(a)
```
Begin
End
```

(b)
```
Begin
utensil name = smallFolk
Utensil(smallFolk)
Meal(smallFolk)
Lunch(smallFolk)
PortableLunch(smallFolk)
Sandwich(smallFolk)
End
```

(c)
```
Begin
utensil name = smallFolk
Utensil(smallFolk)
Meal(smallFolk)
Lunch(smallFolk)
PortableLunch(smallFolk)
Bread()
Lettuce()
Sandwich(smallFolk)
End
```

(d)
```
Begin
Utensil(smallFolk)
Meal(smallFolk)
Lunch(smallFolk)
PortableLunch(smallFolk)
Bread()
Lettuce()
Sandwich(smallFolk)
End
```

(e)
```
Begin
utensil name = smallFolk
Utensil(smallFolk)
Meal(smallFolk)
Lunch(smallFolk)
PortableLunch(smallFolk)
Bread(smallFolk)
Lettuce(smallFolk)
Sandwich(smallFolk)
End
```

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4. 請在下列各小題內，選擇正確、最接近或最合適答案之選項號碼 A，B，C，D 寫入答案卷。注意！作答必須依序標明每小題之題號；答案所填之選項號碼，請如同試題用大寫 A，B，C，D，否則不予計分。 (2 points each)

4.1 Referring to database, which one of the following will introduce anomaly problems but can decrease the number of disk accesses required by certain types of transactions, thus improving performance?
(A) Normalizing (B) Denormalizing (C) Outer join (D) Natural join

4.2 What is the situation in which two or more database users are each waiting to use resources that are held by the other(s)?
(A) Transaction sharing (B) Data fragmentation (C) Deadlock (D) Commit

4.3 Which one of the following refers to the situation where operation and method names can be overloaded to apply to different object types with different implementations?
(A) Polymorphism (B) Object identity (C) Encapsulation (D) Inheritance

4.4 In the entity-relationship model, what kind of entity will you use to implement a many-to-many relationship?
(A) Dependent entity (B) Independent entity (C) Composite entity (D) Weak entity

4.5 Which one of the following is not the feature of a DDBMS?
(A) Relationship transparency (B) Failure transparency (C) Fragmentation transparency (D) Heterogeneity transparency

4.6 Which one of the following is a testing activity during which a selected set of users exercise the system in the deployment environment ?
(A) Pipeline testing (B) Pilot testing (C) System testing (D) Walkthrough

4.7 Which one of the following is very similar to the "Critical path method (CPM)" ?
(A) Gantt chart (B) PERT chart (C) Flow chart (D) Networking chart

4.8 In a CRC card, the name of the class is depicted on the top. What is depicted in the left column ?
(A) Its controller (B) Its super class(C) Its responsibilities (D) Its collaborators

4.9 What will you do if you like to measure whether the company can obtain the hardware, software, and people needed to deliver and then support the proposed information system?
(A) Feasibility assessment (B) Project planning (C) Risk measurement (D) System analysis

4.10 What graphic tool will you use to represent the hierarchy of the modules in a system and the interfaces between them?
(A) E-R Diagram (B) DFD (C) Flow chart (D) Structure chart

4.11 Several types of cohesion have been identified. What cohesion is present when control, rather than data, is passed from one module to the next?
(A) Procedural (B) Communicational (C) Logical (D) Coincidental

4.12 Structured English is the documentation tool that may be used to create process descriptions. What are the allowed logical structures in structured English?
I Case
II Control

注意：背面有試題

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III Branch
IV Repetition
(A) II, III, IV (B) I, II, IV (C) III, IV (D) I, IV

4.13 在下列哪一項傳輸模式中，通道容量(channel capacity)一直由通信雙方分享？
(A) simplex (B) half-duplex (C) full-simplex (D) full-duplex

4.14 若 ASCII 字元採用奇同位(odd parity)的錯誤偵測方式，則每傳輸八個位元的信號時，屬於 0 的信號個數應爲下列哪一項？
(A) 固定爲偶數 (B) 固定爲奇數 (C) 由傳送方決定是奇數還是偶數 (D) 由傳送速率決定是奇數還是偶數

4.15 在資料通信中，所謂流量控制(flow control)是用來防止
(A) Bit errors (B) Overflow of the sender buffer (C) Overflow of the receiver buffer (D) Collision between sender and receiver

4.16 網路設備中的路由器(router)主要是辨識哪一層的位址？
(A) Physical (B) Data link (C) Network (D) Transport

4.17 在現代網路中，ATM 這個縮寫的全稱是
(A) Automated Teller Machine (B) Automatic Transmission Model (C) Asynchronous Telecommunication Method (D) Asynchronous Transfer Mode

4.18 在 TCP 的擁塞控制(congestion control)方法中，slow start 是伴隨下列哪一種策略一起使用？
(A) Additive increase (B) Additive decrease (C) Multiplicative increase (D) Multiplicative decrease

4.19 在 TCP/IP 的五層模式中，資料由低層往高層傳遞時，標頭(header)將被
(A) Added (B) Subtracted (C) Rearranged (D) Modified

4.20 PCM (Pulse Code Modulation)是哪一種轉換？
(A) Digital-to-digital (B) Digital-to-analog (C) Analog-to-analog (D) Analog-to-digital

4.21 以下那一個因素會影響到 PCM 信號重建時的準確性？
(A) Signal bandwidth (B) Carrier frequency (C) Number of bits used for quantization (D) Baud rate

4.22 以下那一種多工技術可以用來傳送數位信號？
(A) FDM (B) TDM (C) WDM (D) None of the above

4.23 Ones Complement 被下列哪一種 Data Link Layer 的技術引用？
(A) Simple parity check (B) Two-dimensional parity check (C) CRC (D) Checksum

4.24 使用 PAP (Password Authentication Protocol)認證時，使用者需要輸入那兩樣訊息？
(A) password and a calculated value (B) authentication identification and password (C) challenge value and password (D) authentication identification and a calculated value

4.25 當 CSMA/CD 偵測到網路上傳輸的資料碰撞時，會做何處理？
(A) The frame is immediately resent (B) A jam signal is sent by the station
(C) The backoff value is set to 0 (D) The backoff value is decremented by 1

4.26 FHSS, DSSS 及 OFDM 屬於網路模型中那一層的技術？
(A) Physical layer (B) Data link layer (C) Network layer (D) Application layer

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4.27 GSM 利用哪一種多工技術將一個 200KHz 的頻道再細分爲 8 個子頻道？
(A) CDMA (B) TDMA (C) FDMA (D) TDMA & FDMA

4.28 下列哪一項不是決定虛擬記憶體分頁(page)大小的考慮因素？
(A) Size of the page table (B) Internal fragmentation (C) CPU speed (D) Input/Output time

4.29 電腦的多工作業系統必須避免程式執行時發生死結(deadlock)， 請問下列那一項不是造成死結的必要條件？
(A) Mutual exclusion (B) Hold and wait (C) No priority (D) No preemption

5. 現代作業系統執行時至少分爲兩種操作模態(operation modes)：kernel mode 以及 user mode。請問爲何要區分成這兩種操作模態？(3 points)
程式如何在這兩種操作模態中切換？(3 points)

6. 每一個作業系統都會提供 IPC(Inter-Process Communication)機制，請任意舉出兩種 IPC 機制並簡述其工作原理。(6 points)

7. 何謂多重開機(multi-boot)？(2 points)
請簡單說明如何實現多重開機？(3 points)