STIW3053

CONFIDENTIAL

UNIVERSITI UTARA MALAYSIA

FINAL EXAM
FIRST SEMESTER SESSION 2011/2012

COURSE CODE / NAME : STIW3053 REAL-TIME PROGRAMMING
DATE : 10 JANUARY 2011 ( TUESDAY )
TIME : 9:00 - 11:30 A.M. ( 2 ½ HOURS )
VENUE : DSB KTM

INSTRUCTION :

1. This exam paper contains ELEVEN (11) questions in TEN (10) printed pages, excluding the cover page.
2. Answer ALL QUESTIONS in this booklet.
3. You are NOT ALLOWED to remove the exam paper from the examination hall.

MATRIC NO : 

IDENTIFICATION CARD NO :

LECTURER :

GROUP : 

TABLE NO. :

DO NOT OPEN THIS EXAMINATION PAPER UNTIL INSTRUCTED

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1. Based on your knowledge of real-time system, answer the questions below.

   a) Define real-time system.  
      (2 marks)

   b) List THREE (3) classifications of real-time system.  
      (3 marks)

   c) Give FIVE (5) examples of real-time system.  
      (5 marks)
2. Based on your knowledge and understanding of concurrency model, answer the questions below.

   a) What proper answers for the roman numbered items in the diagram below?
      (4 marks)

      ![Diagram]

      i. ___________________________
      ii. ___________________________
      iii. ___________________________
      iv. ___________________________

   b) Fill in the blank with correct answer.
      (3 marks)

      ```java
      public class MotorController implements i.________________________
      {
          public ii.______________________(int Dimension,
              UserInterface UI, Robot robo) {
              // No call to super() needed now,
              // otherwise constructor is the same.
          }
          public void iii.____________________()
              // Run method identical.
      }
      // Private part as before.
      ```
3. Based on your knowledge understanding of communication and synchronization in real-time system, answer the questions below.

a) Referring to the synchronized method, fill in the blank with correct answer.
   
   (3 marks)

   ```java
   class SharedInteger {
       public SharedInteger(int initialValue) {
           theData = initialValue;
       }

       public synchronized int i._________() {
           return theData;
       }

       public synchronized void ii.__________(int newValue) {
           theData = newValue;
       }

       public synchronized void iii.___________(int by) {
           theData = theData + by;
       }

       private int theData;
   }
   SharedInteger myData = new SharedInteger(42);
   ```
b) Referring to the readers and writer problem, fill in the blank with correct comments for the code piece.

```
startRead();
    // i. ________________________________
stopRead();

startWrite();
    // ii. ________________________________
stopWrite();
```

(2 marks)

c) Referring to the asynchronous thread control, what is meant by these threads interruptions?

i. **public void interrupt();**

(1 marks)

ii. **public Boolean isInterrupted();**

(1 marks)

iii. **public static Boolean interrupted();**

(1 marks)
Based on your knowledge and understanding of completing concurrency model in real-time system, answer the questions below.

a) Gives a value to define each statement.
   i.  `public static final int MAX_PRIORITY = ____;` (1 marks)
   ii. `public static final int MIN_PRIORITY = ____;` (1 marks)
   iii. `public static final int NORM_PRIORITY = ____;` (1 marks)

b) Differentiate between;
   i. `public ThreadGroup(String name);` (1 marks)
   ii. `public ThreadGroup(ThreadGroup parent, String name);` (1 marks)

c) What are the FIVE (5) characteristics of the Bloch's Thread Safety Levels? (5 marks)
Complete the bounded buffer code piece below. (6 marks)

```java
public class i.___________{
    private int ii.___________[];
    private int iii.___________;
    private int iv.___________;
    private int v.___________ = 0;
    private int vi.___________;

    public BoundedBuffer(int length) {
        size = length;
        buffer = new int[size!];
        last = 0;
        first = 0;
    }
}
```

Complete the memory assignment rules table below. (12 marks)

<table>
<thead>
<tr>
<th>From Memory Area</th>
<th>To Heap Memory</th>
<th>To Immortal Memory</th>
<th>To Scoped Memory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heap Memory</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Immortal Memory</td>
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</tr>
<tr>
<td>Scoped Memory</td>
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</tr>
<tr>
<td>Local Variable</td>
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<td></td>
</tr>
</tbody>
</table>
7. Based on the knowledge and understanding of scheduling and schedulable objects, answer the following question.

a) What are the FOUR (4) schedulable objects attributes? 

b) Fill in the blank with the correct answer of priority scheduler class code piece.

```java
public class i.__________________
    extends ii.__________________
{
    // fields
    public static final int iii._______________;
    public static final int iv._______________;
    // constructors
    protected PriorityScheduler();
    // iv.________________________
    protected Boolean addToFeasibility(
        Schedulable schedulable);
    public Boolean isFeasible();
    protected Boolean removeFromFeasibility(
        Schedulable schedulable);
    public Boolean setIfFeasible(Schedulable schedulable,
        ReleaseParameters release, MemoryParameters memory);
    public Boolean setIfFeasible(Schedulable schedulable,
        ReleaseParameters release, MemoryParameters memory,
        ProcessingGroupParameters group);
    ...
```
8. Describe what bound event handler (BASEH) is. (5 marks)

9. Describe what NoHeapRealTimeThread is. (8 marks)
10. Based on your understanding of asynchronous transfer of control, draw a diagram to show the termination model of THREE (3) methods P, Q, and R. (10 marks)
Based on the resource sharing knowledge and understanding, answer the following question.

a) Write a code piece to construct priority inheritance. (5 marks)

b) Write a code piece to construct monitor control. (10 marks)