

**UECS2103/2403/2423 Operating Systems
Group Assignment**

This is an assignment of a group of 3 - 4 members.

Part A: Threads and synchronisation

(50 marks)

A rover consists of 3 sub-systems:

- Detecting system
- Drilling system
- Cleaning system

The rover will wander around in a target field and try to detect specific materials in the ground. Once materials detected, the drilling system will be activated. It will drill into the ground and collect the material. When the drilling process has collected all the materials found, the cleaning process will start and at the same time the rover will continue to wander around to continue the detection process.

Write a multithreaded program to simulate the operations of the sub-systems in the rover based on the following guidelines:

- Create a separate thread for each sub-system.
- Use random number generator to simulate the detection of materials randomly.
- Synchronise the threads by using synchronisation events.
- The main() method should cancel all the threads when user press CTRL+C.
- In each thread, print output to screen to indicate that it is waiting for signal or it is operating. For example,

```
Detect(): detecting...  
Drill(): waiting...  
Clean(): waiting...
```

Draw a **flowchart** of your program.

Useful links:

[https://msdn.microsoft.com/en-us/library/system.threading.autoresetevent\(v=vs.110\).aspx#Examples](https://msdn.microsoft.com/en-us/library/system.threading.autoresetevent(v=vs.110).aspx#Examples)

<https://docs.microsoft.com/en-us/dotnet/api/system.threading.waithandle.waitone?view=netframework-4.7.2>

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Part B: Real-Time OS

(30 marks)

Autonomous car has received a lot of attention from car manufacturers. Consider the real-time system that is running the car. Identify a real-time task that is related to each of the followings:

- The safety of passengers.
- The comfortableness of passengers.
- Energy consumption.

For each real time task,

- describe the task and its purpose.
- identify whether the task is a hard real-time or soft real-time task.
- describe the consequence if the task failed.

Submission:

Items to be submitted:

1. Documentation that contains
 - **Flowchart** of the program in Part A.
 - **Part B**
2. Project folder of the program.

The front page of the documentation should contain the marking scheme in ***OSA_Marking.docx***. Save all the above items in a folder with your name as the folder name, zip the folder and email to:

sorkv@utar.edu.my with **OS Assignment** as the email title.

List your group members in the submission email. Name that is not found in any group is considered as didn't submit the assignment.