CE00526-5 CPICS

2014 Assignment

Airplane Terminal Simulation
You are required to write a C# simulator for an airplane terminal system, with typical geometry as indicated on the next page. The simulator is to assist system analysts with looking at dead-locks when the terminal is overloaded with planes.

The assignment primarily tests your understanding of concurrent programming concepts from a C# perspective. The graphics required, in the assignment, is to validate the correct workings and synchronisations of your system.

Demonstration
Your system must be demoed to your tutor, within the weekly tutorial slots, by booking an appointment with your tutor who will "profile" the functionality of your system at the demonstration, based form on the rubric on page 3 of this document.

You should book the demonstration of your C# system with your tutor, in one of the tutorial slots in weeks 10-12. Booking earlier is also possible.

Blackboard Electronic Hand-in Details
The blackboard hand-in dead-line for the three electronic items ;
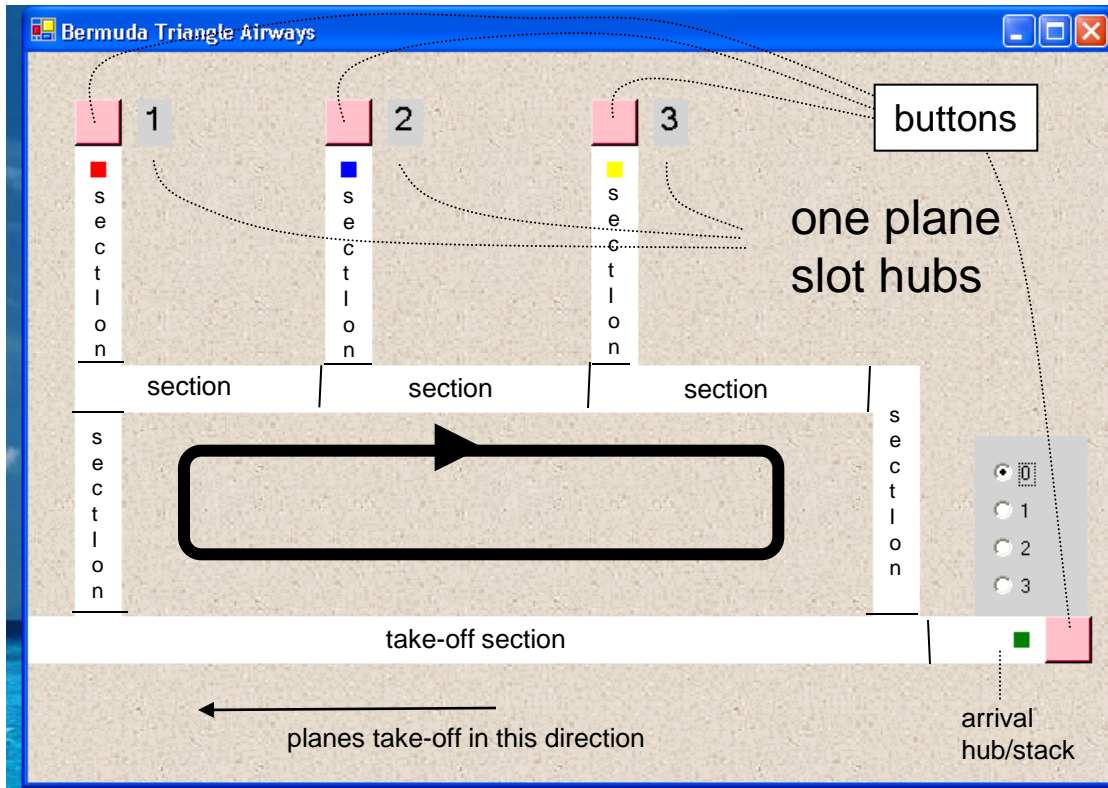i - Design, ii - Explanation of strategy , iii - C# code is :-

> **THU 10th April 2014 before 3.30pm**

You need to upload a single **.pdf** file with the above items in the order; Design first, Explanation second and C# Code third.

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Geometry of Airport Terminal

Below is given a typical set-up for the simulation. Three planes are waiting to take off from "hubs" 1,2 and 3 and a plane is queued for an arrival at the entry hub. The arrival plane is given its hub address of 1,2, 3 or 0 – the latter means it will land and then take off – at the left.

Bermuda Triangle Airways

1   2   3   buttons

section   section   section

one plane slot hubs

section   section   section

section   section

take-off section

○ 0
○ 1
○ 2
○ 3

arrival hub/stack

planes take-off in this direction

Planes must adhere to the indicated one-way system whether landing or taking off. Sections must only ever have at most one plane occupying them - including the hubs. A plane must wait if a section it wishes to enter is occupied. The arrival and hub buttons act as toggles to trigger movement, buttons are either set to "green" or "pink".

In "green" mode planes can turn round at hubs. In "pink" mode they are "held" at hubs / landing(s). For the three landing sections they need to alternate between "take-off" and "landing" modes.

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Demo Rubric

Grid View   List View

	0 marks	4 marks	8 marks	12 marks	16 marks	20 marks
Basics [20]	**0** (0%) No attempt.	**4** (4%) Attempted graphics but display doesn't work.	**8** (8%) Airport graphic with ten sections.	**12** (12%) No buttons but executes.	**16** (16%) Take-off buttons only.	**20** (20%) Interaction buttons at take-off hubs and landing button.
Take-Off [20]	**0** (0%) No take-offs.	**4** (4%) Plane movement in a section.	**8** (8%) Planes move to another section.	**12** (12%) Planes move through multiple sections.	**16** (16%) Three-plane take-off works with some plane display loss.	**20** (20%) Three-plane take-off works perfectly.
Landing [20]	**0** (0%) No landings.	**4** (4%) Attempted but doesn't work.	**8** (8%) Planes cycle around but don't go to their target hub.	**12** (12%) Plane moves to its target landing hub.	**16** (16%) Plane enters its correct landing hub.	**20** (20%) Landing plane waits if target take-off hub occupied.
Extras [20]	**0** (0%) No extras.	**4** (4%) One working extra.	**8** (8%) Two working extras.	**12** (12%) Three working extras.	**16** (16%) Four working extras.	**20** (20%) Five working extras.
Documentation [20]	**0** (0%) No explanation of strategy. No design. No code.	**4** (4%) Code only.	**8** (8%) One only of explanation of strategy and design but code provided.	**12** (12%) Sound explanation and layout of strategy, design and code.	**16** (16%) Very Good explanation and layout of strategy, design and code.	**20** (20%) Superb explanation and layout of strategy, design and code.

NB
There are five mark sections each worth 20 marks (20% each). The documentation needs to be submitted on or before the stated dead-line. At the demo the first four mark sections will be assessed. The documentation mark will be allocated after the hand-in.

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Mark Scheme – 100 marks in total

Basics	-	[20]	see Blackboard
Take-Off	-	[20]	"
Landing	-	[20]	"
Extras	-	[20]	"
Documentation	-	[20]	"

For the first three components check the criteria on Blackboard. The last two components are as below.

Extras [20]
These could include, for example ; signal lights, change of speed at take-off and landing in landing section, colour coding of sections when entered, graphic for plane, rotation of graphic plane .

Documentation [20]
This should have the following three items.

i) **Design**
A diagram / map of all the threads running in the system and how they interact with one another .
eg Mascot-like concurrency network diagram.

ii) Explanation of Strategy
A clear explanation of the strategy used to ensure that two or more planes never enter the same section of the airport terminal.

iii) Your C# code
Quality criteria include; indentation, use of white-space, sensible names for variables, use of multi-threading, use of synchronisation adts, and paginated well-layed out code.

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Some Important Pointers

Note 1
Informally you can show/discuss your system with your tutor, during the practical sessions.

Note 2
Take frequent back-ups of your code.

Note 3
You must meet the 3.30 deadline otherwise all marks are forfeit.

Note 4
The code demoed must be C# - you can use your own machines.

Note 5
No demo before the 3.30 deadline THU 10th April means zero marks.