2.1.5
THINKING CONCURRENTLY
TOPIC WISE EXAM QUESTIONS
ANSWERS

A-LEVEL OCR

7	(b)	(i)	1 mark for each to max 2 • Processes happen at the same time // processes overlap • One process can start before another one finishes • Each process is given a slice of processor time • Different processes can be executed (in parallel) by different processors/cores	2	
7	(b)	(ii)	1 mark each to max 2 e.g. • More efficient processor use // Less idle time for processor // Greater throughput • Long running tasks do not delay short running tasks • Tasks requiring preconditions can wait and then resume execution • User is able to interact with the computer while other tasks are running	2	

1bi	1 mark per bullet to max 2 e.g. • Multiple processes being executed at the same time // appearing to happen simultaneously • Giving processes a slice of the processor time • Having multiple processors each carrying out a different process	2 AO1.1 (2)	
1bii	1 mark per bullet to max 3 e.g: • Game could have large number of requests to the server at a time • … server needs to respond in reasonable time • … having multiple processors handling the different requests would increase response time • Users could override each other's changes • … e.g. needs to handle if someone updates their circus while someone else is visiting • …use record locking to stop edits if someone else has access to data • Different users will have different response times • …therefore the processor can still handle other requests • …so that the performance for other users is not affected	3 AO2.1 (2) AO2.2 (1)	

2b

Mark Band 3 – High level (7-9 marks)
The candidate demonstrates a thorough knowledge and understanding of concurrent processing; the material is generally accurate and detailed.
The candidate is able to apply their knowledge and understanding directly and consistently to the context provided. Evidence/examples will be explicitly relevant to the explanation.
There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.

Mark Band 2 – Mid level (4-6 marks)
The candidate demonstrates reasonable knowledge and understanding of concurrent processing; the material is generally accurate but at times underdeveloped.
The candidate is able to apply their knowledge and understanding directly to the context provided although one or two opportunities are missed.
Evidence/examples are for the most part implicitly relevant to the explanation.
The candidate provides a reasonable discussion, the majority of which is focused. Evaluative comments are, for the most part appropriate, although one or two opportunities for development are missed.
There is a line of reasoning presented with some structure. The information presented is in the most part relevant and supported by some evidence.

Mark Band 1 – Low Level (1-3 marks)
The candidate demonstrates a basic knowledge of concurrent processing with limited understanding shown; the material is basic and contains some inaccuracies. The candidates makes a limited attempt to apply acquired knowledge and understanding to the context provided.
The candidate provides a limited discussion which is narrow in focus. Judgements if made are weak and unsubstantiated.
The information is basic and comunicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.

9
AO1.1 (2)
AO1.2 (2)
AO2.1 (2)
AO3.3 (3)

AO1: Knowledge and Understanding
Indicative content
- Processes are happening at the same time/at overlapping times
- One process may need to start before a second has finished
- Individual processes are threads, each thread has a life line
- One request will be sent to the server, this will have a thread

AO2: Application
- Multiple requests to the server can be made at the same time
- Programming on server will need to allow multiple threads to manipulate a list of requests
- Programming will need to restrict access to the database of seats/sales etc.
- Will allow those reading and writing to manipulate at the same time
- Record locking will need implementing – more complex programming
- May be selling alongside other systems, therefore needs to communicate with external systems that will also use record locking to avoid two different external companies accessing and selling the same tickets.

AO3: Evaluation
- Will allow for multiple access to the website at the same time by different customers – as it would happen in real life

6 (c)

Mark Band 3 – High level (7-9 marks)
The candidate demonstrates a thorough knowledge and understanding of caching and concurrent processing; the material is generally accurate and detailed.
The candidate is able to apply their knowledge and understanding directly and consistently to the context provided. Evidence/examples will be explicitly relevant to the explanation.
There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.

Mark Band 2 – Mid level (4-6 marks)
The candidate demonstrates reasonable knowledge and understanding of caching and concurrent processing; the material is generally accurate but at times underdeveloped.
The candidate is able to apply their knowledge and understanding directly to the context provided although one or two opportunities are missed. Evidence/examples are for the most part implicitly relevant to the explanation.
The candidate provides a reasonable discussion, the majority of which is focused. Evaluative comments are, for the most part appropriate, although one or two opportunities for development are missed.
There is a line of reasoning presented with some structure. The information presented is in the most part relevant and supported by some evidence.

Mark Band 1 – Low Level (1-3 marks)
The candidate demonstrates a basic knowledge of caching and concurrent processing with limited understanding shown; the material is basic and contains some inaccuracies. The candidates makes a limited attempt to

9
AO1.1 (2)
AO1.2 (2)
AO2.1 (2)
AO3.3 (3)

AO1: Knowledge and Understanding
Indicative content
Caching
- Previously used data is stored in a location…
- that can be quickly accessed …
- to speed up retrieval if needed in future
Concurrent Processing
- several processes work simultaneously to solve a problem

AO2: Application
Caching
- search for previously searched for data items in a faster secondary storage device/RAM
- Speed up access for that item
…Relies on same item being searched for multiple times
…Kamran needs to decide how feasible this is based on the number of item
Concurrent
- Computer would have multiple processors…
- Each searching part of the data structure at one time…
- This would be limited by bottlenecks such as accessing the storage device
- The n processors could potentially mean an increase of up to $1/n$ of time…realistically speed increase is likely to be less than that
- Only useful if using linear search // binary search cannot be performed concurrently

AO3: Evaluation
Candidates will need to evaluate the benefits and drawbacks of caching and concurrent processing
Allow any point of view (caching / concurrent / both) as long as argument is presented suitably.

OM

2	f	Mark Band 3 – High level	9	AO1: Knowledge and Understanding

Mark Band 3 – High level
(7-9 marks)
The candidate demonstrates a **thorough** knowledge and understanding of concurrent programming; the material is generally accurate and detailed.
The candidate is able to apply their knowledge and understanding directly and consistently to the context provided. Evidence/examples will be explicitly relevant to the explanation.
There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.

Mark Band 2 – Mid level
(4-6 marks)
The candidate demonstrates **reasonable** knowledge and understanding of concurrent programming; the material is generally accurate but at times underdeveloped.
The candidate is able to apply their knowledge and understanding directly to the context provided although one or two opportunities are missed.
Evidence/examples are for the most part implicitly relevant to the explanation.
The candidate provides a reasonable discussion, the majority of which is focused. Evaluative comments are, for the most part appropriate, although one or two opportunities for development are missed.
There is a line of reasoning presented with some structure. The information presented is in the most part relevant and supported by some evidence.

Mark Band 1 – Low Level
(1-3 marks)
The candidate demonstrates a **basic** knowledge of concurrent programming with limited understanding shown; the material is basic and contains some

inaccuracies. The candidates makes a limited attempt to apply acquired knowledge and understanding to the context provided.
The candidate provides a limited discussion which is narrow in focus. Judgements if made are weak and unsubstantiated.
The information is basic and comunicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.

0 marks
No attempt to answer the question or response is not worthy of credit.

9
AO1.1 (2)
AO1.2 (2)
AO2.1 (2)
AO3.3 (3)

AO1: Knowledge and Understanding
Indicative content
- Processes are happening at the same time/at overlapping times

- Only 1 process can actually happen at a time on a single core processor, concurrent tries to simulate multiple processes

- One process may need to start before a second has finished

- Individual processes are threads, each thread has a life line

AO2: Application
- Multiple orders can be made and added to the list at the same time

- Programming will need to allow multiple threads to manipulate a single list

- Will allow those reading and writing to manipulate at the same time

- Locking will need implementing – more complex programming

AO3: Evaluation
- Will allow for multiple orders at the same time – as it would happen in real life

- Access to the linked list will need to be limited so it cannot be accessed/overwritten by two threads trying to do different operations

- Not all of the process will be paralleliseable. X processors does not mean it will run in 1/xth of the time of one processor.

| 1 | | | Max 1 for explanation of concurrent programming.
Max 3 for each example.

Concurrent processing:

• One process does not have to finish before the other starts (1)

Example e.g.

• Each plane can move independently (1)
• All move at the same time (1)
• All need to react to different events (1)
• The weather (1)
• Wind, rain, direction of air etc. (1)
• Each element needs to be run simultaneously (1)
• It will react to its own stimulii (1) | 4 | Accept any reasonable suggestion for concurrent programming in the simulator

For examples:
1 mark for identifying example.
1 mark for saying how they act concurrently.
1 mark for saying why this is necessary. |

If you found this useful, drop a follow to help me out!

THANK YOU!

GCST