

2.2.2

COMPUTATIONAL METHODS

TOPIC WISE EXAM QUESTIONS

some more questions can be found on 2.1.1
Thinking abstractly 2.1.2 Thinking ahead 2.1.3
Thinking procedurally 2.1.4 Thinking logically 2.1.5
Thinking concurrently as those and this link

A-LEVEL

OCR

<p>a) Features that make a problem solvable by computational methods.</p> <p>b) Problem Recognition.</p> <p>c) Problem Decomposition.</p> <p>d) Use of divide and conquer.</p> <p>e) Use of abstraction.</p> <p>f) Learners should apply their knowledge of:</p> <ul style="list-style-type: none">• backtracking• data mining• heuristics• performance modelling• pipelining• visualisation to solve problems.	<p>Candidates need to be able to determine if a problem can be solved using computational methods, such as decomposition, abstraction, calculations, storage of data.</p> <p>Candidates need to be able to recognise a problem from a description of a scenario, decompose the problem and use abstraction to design a solution.</p> <p>Candidates need to understand how divide and conquer can be used within a task to split the task down into smaller tasks that are then tackled. Candidates also need to identify how tasks can be carried out simultaneously to produce a solution.</p> <p>Candidates need to understand the purpose of backtracking within an algorithm, for example when traversing a tree. Candidates need to be able to read, trace and write code that makes use of backtracking for a given scenario.</p> <p>Candidates need to understand what is meant by data mining, and how data mining is used in a situation. Candidates need to understand the complexities within data mining and how a program will search for and interrogate the data.</p> <p>Candidates need to understand what is meant by heuristics, and how they can be used within a program (for example the A* algorithm). Candidates should have some experience of programming a simple heuristic, and be able to apply their knowledge to a given scenario to explain the purpose and benefits of using heuristics in a solution.</p> <p>Candidates need to understand the principles, and purpose of performance modelling, and how it is used in the production of software.</p> <p>Candidates need to understand the principle of pipelining and how it is used within programming (for example the result from a process feeds into the next process).</p> <p>Candidates need to understand how visualisation can be used to create a mental model of what a program will do or work, and that from this they can plan ahead what is going to happen or what they will need to do.</p>
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- 5 Fig. 5 shows a graph data structure representing a small section of a parcel delivery network. Each node represents an address where deliveries need to be made. The edges show the possible routes and distances between these deliveries.

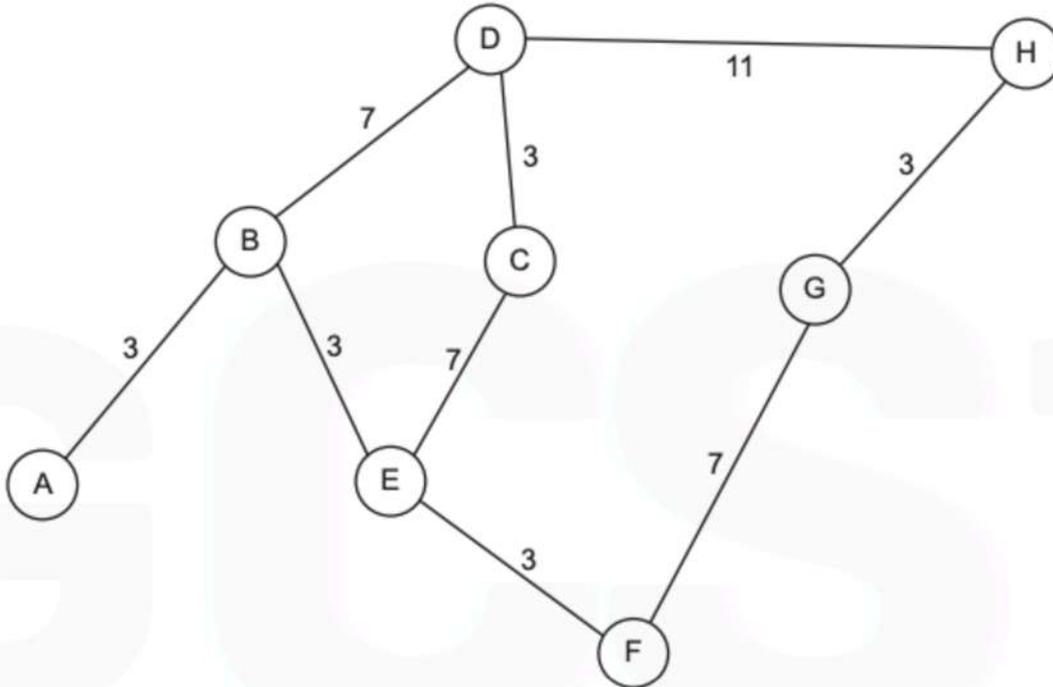


Fig. 5

- (b) Give **one** reason why the graph is a visualisation of the problem.

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..... [1]

- (d) (i) State why performance modelling is used to test a system.

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- (ii) Describe how performance modelling can be used in the delivery system.

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..... [2]

- 1 Taylor is creating an online multiplayer game where users can create accounts and build their own circus. Each circus will contain characters such as clowns, animals, magicians and dancers.

Users can set up a new circus in the online world, purchase new characters and visit other users' circuses.

- (e)* The game will have thousands of users. Taylor will store data about the users and their actions while playing the game in a large database.

Evaluate how Taylor can use data mining to inform future changes to improve his circus game. [9]

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6 Amy's processor makes use of pipelining during the fetch-decode-execute cycle.

(a) The processor's pipeline consists of the following stages:

- Fetching the instruction from memory
- Decoding the instruction
- Executing the instruction.

Instructions A, B, C and D need to be processed.

Identify the stage(s) and instruction(s) run during each pipeline below.

Pipeline 1

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Pipeline 2

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Pipeline 3

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Pipeline 4

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[4]

(b) Explain why pipelining can improve the performance of the processor.

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..... [2]

4 Mabel is a software engineer. She is writing a computer game for a client. In the game the main character has to avoid their enemies. This becomes more difficult as the levels of the game increase.

(a) Mabel uses decomposition to design the program.

Explain how decomposition can aid the design of this program.

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(b) The computer game allows a user to select a character (e.g. name, gender). They can then choose a level for the game (easy, normal, challenging). The user controls their character by moving it left or right. The character can jump using space bar as an input. If the character touches one of the enemies then it loses a life. The character has to make it to the end of the level without losing all their lives.

(iii) Define pipelining and give an example of how it could be applied in the program.

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6* Benedict runs a social networking website. He has been told he should use data mining to help him enhance and improve his website.

Evaluate the use of data mining to help Benedict enhance and improve his social networking website. [9]

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- 2 A company merger is joining five e-commerce retailers under one company, OCRRetail. Each retailer has a different sales system and OCRRetail wants to develop one computer system that can be used by all the retailers.

Mary's software development company has been employed to analyse and design a solution for the company.

- (a) (i) Two computational methods (techniques used to solve a problem using computational thinking) that Mary will use are problem recognition and decomposition.

State what is meant by problem recognition and decomposition.

Recognition

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Decomposition

..... [2]

- (ii) State **one** additional computational method.

..... [1]

- (b) Mary plans to use data mining to generate information about OCRRetail's customers. Mary will use this information to benefit the company.

- (i) Define the term 'data mining'.

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..... [1]

- (ii) Identify **two** pieces of information that data mining could provide OCRRetail about sales, and state how OCRRetail could make use of this information.

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- (c) Mary has developed the program and is considering using performance modelling before installing the system.

- (i) Define the term 'performance modelling'.

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- (ii) Identify **one** way performance modelling could be used to test the new system.

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- 3 A puzzle has multiple ways of reaching the end solution. Fig. 3 shows a graph that represents all possible routes to the solution. The starting point of the game is represented by A, the solution is represented by J. The other points in the graph are possible intermediary stages.

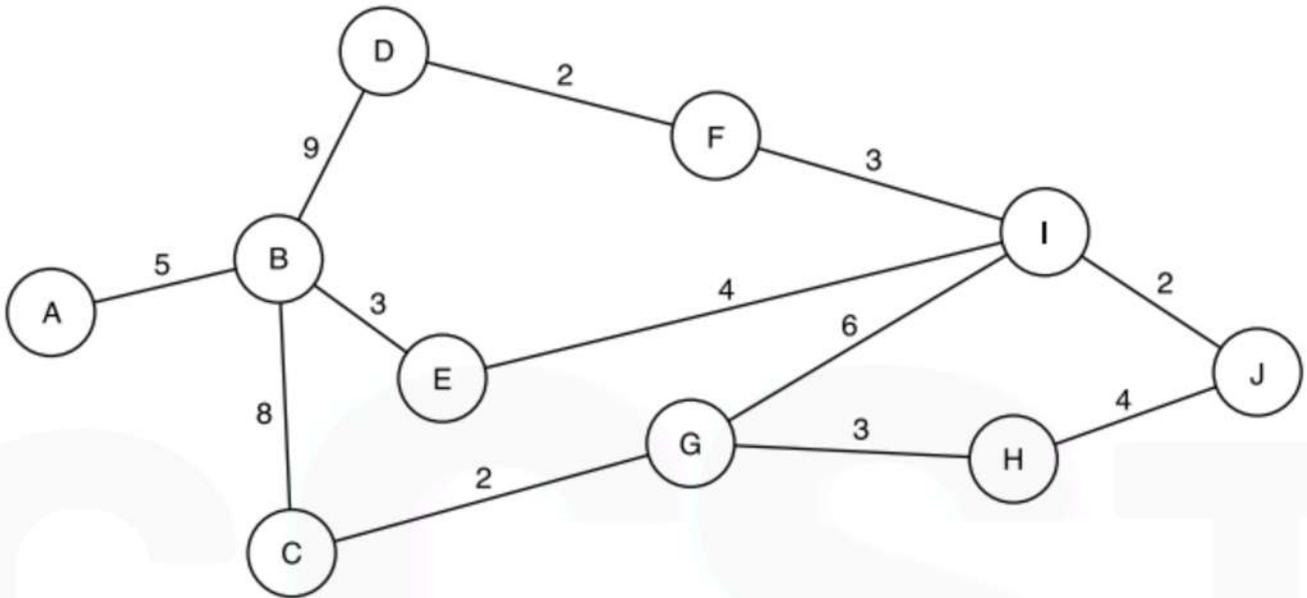


Fig. 3

- (iii) Identify **two** advantages of using a visualisation such as the one shown in Fig. 3.

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6(b) The developer is using decomposition to design the game.

(i) Describe the process of decomposition.

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GCST

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

THANK YOU!

GCST