

Computer science
Higher level
Paper 3

Monday 7 May 2018 (morning)

1 hour

Instructions to candidates

- Do not turn over this examination paper until instructed to do so.
- A clean copy of the **computer science case study** is required for this examination paper.
- Read the case study carefully.
- Answer all questions.
- The maximum mark for this examination paper is **[30 marks]**.



Answer **all** questions.

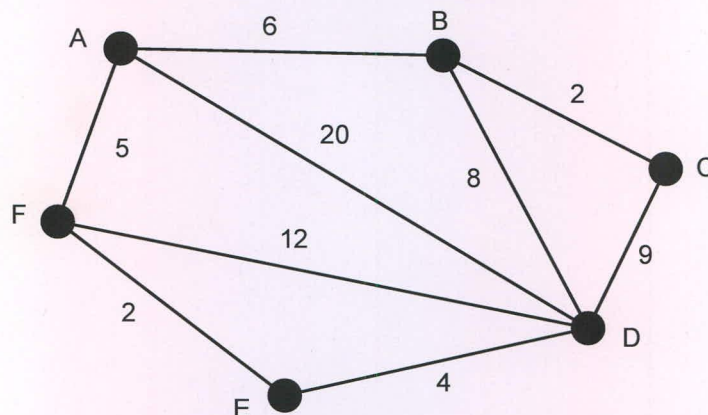
1. (a) Define a *greedy algorithm*. [2]
- (b) Outline the contribution that LIDAR makes as one of the main sources of data collection for an autonomous car. [2]
2. (a) Suggest how the use of the VTV and VTI protocols could lead to a safer and more efficient transport system in a city into which only autonomous cars would be allowed. [4]
- (b) One of the ethical issues identified in the case study as being a possible consequence for autonomous vehicles is the "Trolley Problem". The case study also states that driving decisions in autonomous cars may be automatically made by CNNs that have been trained through end-to-end learning.

By examining the above statements, discuss the level of importance that the technical team should give to the ethical problem known as the "Trolley Problem". [4]

3. The taxi project is being tested by using Dijkstra's algorithm for finding the shortest distance between two points. The diagram below shows a partial map of the town's roads where the numbers are the times taken to travel between adjacent nodes (where the nodes represent the intersections of the roads).

Without writing code, state the basic steps that are followed by this algorithm.

You should include in your answer a copy of the town map on which you can simulate the algorithm for a journey that takes the shortest route between A and D. [6]



4. One of the major contributions in the recent research into the implementation of autonomous vehicles such as in the *Levangerstadt* project has been the development of deep learning algorithms that contribute to the making of rapid driving decisions. This development has been made possible due to the evolution of CNNs and improvements in processing speeds.

Discuss the contribution that deep learning has made to the anticipated success of the *Levangerstadt* project. You should make reference to the computer science identified in this case study. [12]

