

**ACMP 271: FOUNDATIONS OF DATA COMMUNICATION AND NETWORKS TAKE
AWAY CAT2**

Submission Date 31/03/2021

- a) Infotronics is a private college that provides part-time and full-time courses in IT and business. It is planning to move to a new site and is considering the networking that should be installed. The site consists of three buildings. The education complex building contains a dedicated computer room with a number of high performance dedicated servers. The servers provide services to students and staff who may access them either over the Internet or over the College's own internal network. The science complex building contains the staff offices, for both lecturers and administrative staff. They have desktop computers on fixed desks, from which they need access to the Internet and to other College servers. The Fassi complex building and the Science complex building are linked by an underground backbone optic fibre cable duct. The Agriculture complex building contains a reception desk, lecture rooms and a café. There is no duct linking it to the other buildings. The lecture rooms have a desktop computer at the front for use by the lecturers, but some lecturers prefer to use their own laptop, tablets or smart phones with internet enabled features. All the students use laptop, tablets or smart phones to take notes and keep in touch with their friends.
- i) What type of network should be deployed in the education complex building and what equipment should be installed? **(4 Marks)**
 - ii) What type of network should be deployed in the science complex building and what equipment should be installed? **(4 Marks)**
 - iii) What type of network should be deployed in the Agriculture complex building and what equipment should be installed? **(4 Marks)**
 - iv) What type of network connections should be used to link the buildings together and where and how should the College's Internet connection be made? Use well labelled diagrams **(4 Marks)**
- b) In synchronous time division multiplexing, it is possible to interleave bits, one bit from each channel participating in a cycle. If the channel is using a self-clocking code to assist synchronization, might this bit interleaving introduce problems because there is no continuous stream of bits from one source? **(4 Marks)**
- c) A company has an office based in Nakuru with a network that houses two web servers. One of these web servers is designed for external access, the other is an intranet web server designed only to be accessible to employees of the company. The company also has another office located in Kisumu, which is externally connected to the Nakuru office through a virtual private network routed over the public internet. This virtual private network must always be active, and not raised on demand by individual members of staff in the Kisumu office. Both offices continue to use IP version 4 addresses, but the company only has a single public IP address range of 200.10.10.0/26. They require more nodes than the 62 allowed by this range, and so all nodes in the networks are numbered with private addresses from the 10.0.0.0/8 range.
- i) Describe, with the aid of a diagram, a network topology that will interconnect the two offices and that will also allow public access to the external web server. **(5 Marks)**
 - ii) Clearly identify all routing or switching components required, and label IP addresses and subnets for at least one node in Nakuru, one node in Kisumu and all other identified components. **(5 Marks)**
 - iii) The diagram should also indicate how the routing of private addresses to the Internet is achieved, and the function of the relevant components should be described. **(7 Marks)**
 - iv) In case Nakuru office cannot access Kisumu office, clearly describe how to troubleshoot the main components between the two offices. **(3 Marks)**