A1.

This question is about the frames used by the Local Area Network (LAN) technology known as Ethernet /IEEE 802.3.
a) Produce a sketch diagram to show the fields of a frame as used by Ethernet / IEEE 802.3. **(6 marks)**

b) Explain the role of the preamble and start of frame delimiter fields in an Ethernet / IEEE 802.3 frame. **(6 marks)**

c) How was the original definition of an Ethernet / IEEE 802.3 frame updated by IEEE 802.1Q to permit the use of Virtual Local Area Networks (VLANs)?

(4 marks)
d) What range of sizes is permitted for the data/payload field of an Ethernet / IEEE802.3 frame? **(3 marks)**

e) Why was it necessary to specify both a minimum length and a maximum length for the data/payload field of an IEEE802.3 frame? **(6 marks)**

A2.

This question is about the service provided by the Transmission Control Protocol (TCP) and User Datagram Protocol (UDP).
a) What is the difference in the service offered to applications by the TCP and UDP protocols? **(8 marks)**

b) For each of the following applications determine whether you would use TCP or UDP and explain the reasons for your choice.
i. File transfer **(3 marks)**

ii. Watching a real time streamed video **(3 marks)**

iii. Web browsing **(3 marks)**

iv. A Voice Over IP (VoIP) telephone conversation **(3 marks)**
c) Both TCP and UDP use port numbers. What are these port numbers used for?

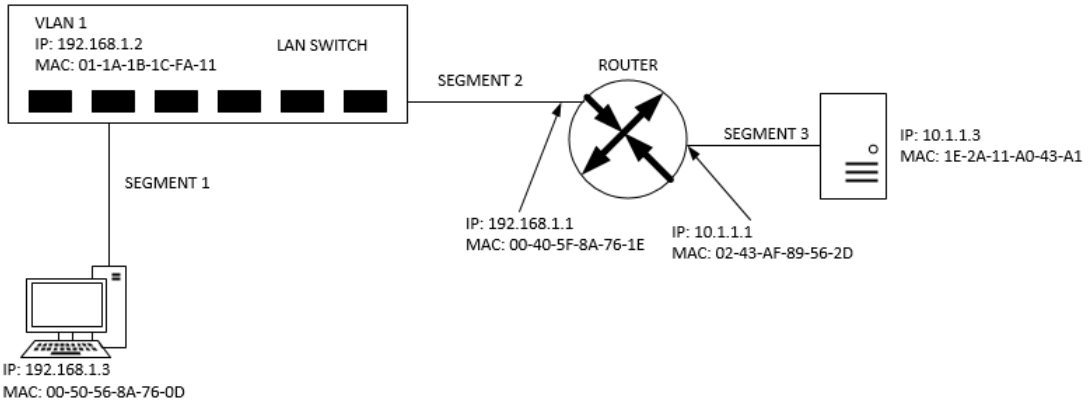
(5 marks)

A3

This question is about the ISO Reference Model and the TCP/IP protocol stack.
a) The ISO Reference Model defines seven protocol layers, each of which is responsible for a specific range of functions. By considering this model, mention two main functions performed by a protocol operating at the network layer.

(2 Marks)
b) Give the names of the seven layers of the ISO Reference Model and the names of the four corresponding layers in the TCP/IP protocol stack, showing the correspondence explicitly. **(11 marks)**

c) Figure 1 shows a small scale network comprising one switch and one router. A personal computer is connected to the switch and a server is connected to the router. All switch and router ports are IEEE 802.3 CSMA/CD.



For this network, consider data being sent from the personal computer to the server and indicate the values of the source and destination address fields of the frame and the IP header for each segment. **(12 marks)**