4)

a) Identify and explain some of the main differences between the User Datagram Protocol (UDP) and the Transaction Control Protocol (TCP) when used over IP networks.

(10 marks)

b) What is the purpose of *ports* in the UDP and TCP protocols?

(5 marks)

c) TCP requires a *three way handshake* during the connection setup phase. Carefully describe how this handshake scheme works. What are the consequences (if any) of each of the packets involved in this handshaking becoming lost or duplicated.

(12 marks)

d) Once a TCP connection is established it may seem advantageous to always compress the data which is to be transmitted. Explain why this is not always the case.

(6 marks)

5)

a) What are the essential features of the public key and the private key in a public key encryption algorithm.

(4 marks)

b) Define each of the following terms and show what roles each of these techniques has in providing network security.

i) Authentication *(3 marks)*

ii) Message Integrity *(3 marks)*

iii) Non-repudiation *(3 marks)*

c) The JPEG compression scheme can achieve very high compression ratios on photographic images. The amount of compression that is undertaken can be determined by the user. Explain which feature or features of JPEG compression allow variable compression ratios on the same image.

(7 marks)

d) What is the purpose of the following standards, used in network application communications.

i) SMTP *(2 marks)*

ii) MIME *(2 marks)*

iii) POP3 *(2 marks)*

e) Describe carefully how the three standards listed in part c work together to deliver an e-mail with a JPEG image as an attachment from the sender to the receiver.

(7 marks)