

**NAPIER UNIVERSITY**  
**SCHOOL OF COMPUTING**

**SESSION 2001-2002**

**MODULE: CO32010**

**NETWORK OPERATING SYSTEMS**

**DATE:**

**DURATION: 2 HOURS**

**START TIME:**

**EXAMINER(S)**

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**QUESTION PAPER DATA**

**Number of pages - 7**  
**Number of questions - 6**  
**Number of sections - ONE**

**INSTRUCTION TO CANDIDATES**

**Complete any three of the questions from six.**

1 The network illustrated in Figure Q1 has the following parameters:

Network address: 46.x.y.z  
Number of nodes on each subnet: 4094

- (a) Subnet the network by assigning network addresses for NETA, NETB, NETC and NETD. Also determine the range of addresses which can be used for NETA, and the subnet mask for the complete network. (10)
- (b) Design and apply ACL statements on Router A that would allow the upper half of the network host range of NETA access to the FTP\_01 server (Staff permission), and bar the lower half of the address range. (10)
- (c) Explain a method that could be used to control access to external WWW servers for all the users in NETA, and how WWW traffic from outside the network could be barred from access to NETA. (5)

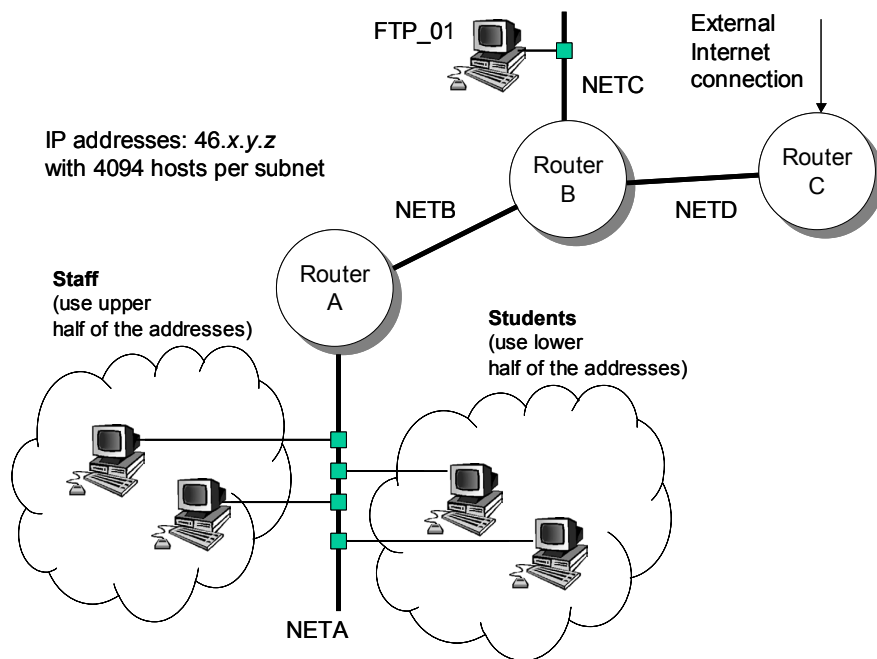


Figure Q1.

**Total Marks [25]**

- 2 (a) Explain how interior and exterior routing protocols are used to create a simpler model of the Internet. If a network connects to an external network of 146.176.10.0, and two internal networks of 146.176.11.0 and 146.176.12.0, show the router commands which could be used to setup the RIP routing protocol, so that the routing tables for the internal networks would not be transmitted to the external network.

(6)

- (b) A network of routers is illustrated in Figure Q2. The error rates on the links are:

Link	Error rate
A to B	0.15 [15%]
B to C	0.1 [10%]
A to C	0.05 [5%]
A to D	0.2 [20%]
C to D	0.1 [10%]
D to E	0.1 [10%]
C to E	0.3 [30%]

Determine the following:

- The number of possible routes from Router A to Router E, without retracing the same route.
- For RIP, which router(s) would be the next destination for data going from A to E.
- In a routing protocol based on errors rates, determine the probability of data being sent without error from Router D to Router A. Which route would be chosen?
- If the link between router B and C has just gone down, what problems might occur in the network, and how could they be overcome?

(19)

**Total Marks [25]**

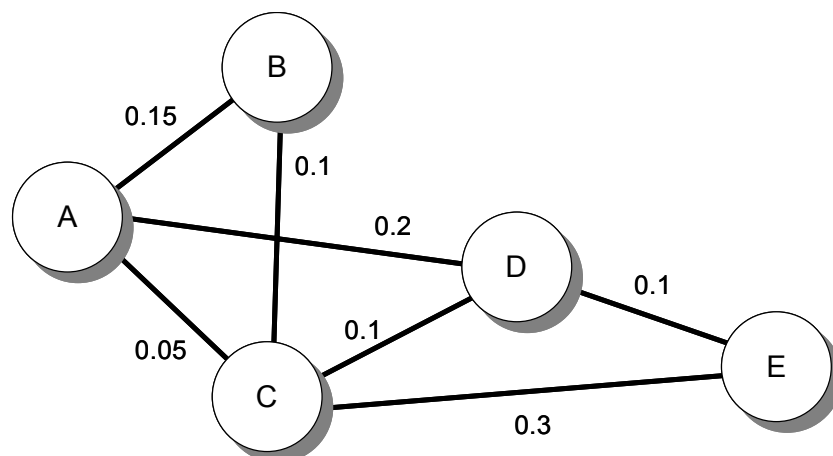


Figure Q2.

- 3
- (a) Explain the term RPC (Remote Procedure Call) and its relevance to network file sharing. (3)
  - (b) What is the function of the utility *rpcinfo*? (3)
  - (c) Describe the role of the RPC *port mapper* service and state why it is important. (4)
  - (d) Figure Q3 shows an outline directory structure for three networked UNIX systems (mercury, venus and mars) each could be both NFS server and/or client. It is desired that any one of three users (anne, bob or colin) should be able to login to any of the three systems and see their own files using the same pathname. In other words the perceived location of each users' files is not dependent on the machine they are using. Detail the configuration actions required to achieve this. (10)
  - (d) Describe the role of the *.htaccess* file in the file system of a Web Server. (5)

**Total Marks [25]**

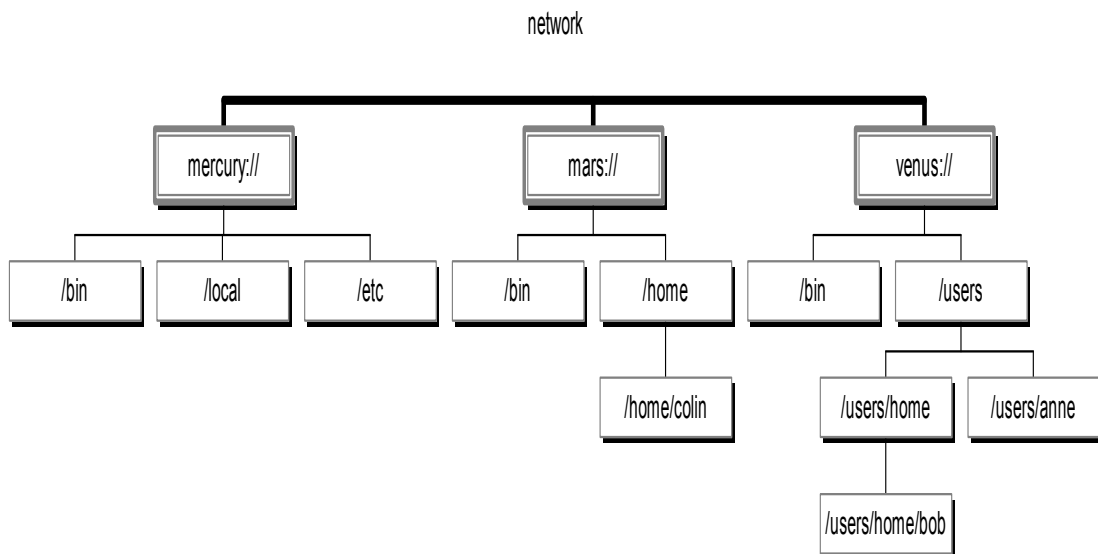


Figure Q3.

- 4
- (a) An encryption technique allocates several alternative ciphertext representations for the same plaintext character for cases where the plaintext character is relatively common (e.g. “E”, “A”, “T” etc.). Explain the benefit of these multiple codes if any exist?  
(3)
  - (b) In simple Electronic Code Book encryption why would it be inadvisable to use a technique which encrypted individual single bytes rather than large chunks of the message, for example 64 bits at a time.  
(3)
  - (c) Digital Encryption Standard (DES) uses a combined technique based on several simple encryption methods. Explain the following terms as applied to DES.
    - (i) Bit Permutation  
(3)
    - (ii) XOR  
(3)
    - (iii) Substitution Boxes  
(4)
  - (d) Discuss the advantages and disadvantages of making an encryption algorithm public or keeping its details secret.  
(5)
  - (e) When producing a *message hash* the result is always the same size regardless of the size of the plaintext message, explain.  
(4)

**Total Marks [25]**

- 5
- (a) What property of the product of two large prime numbers makes this a suitable basis for the creation of an asymmetrical (public key) encryption technique? (4)
  - (b) The concept of *non-repudiation* is important in the conduct of e-commerce, explain how public key encryption schemes support this property. (6)
  - (c) Describe the *man-in-the-middle* attack as applied to a public key encryption system. (7)
  - (d) The following pair of values for  $E$  and  $n$  make up a valid RSA public key  $(E,n)$ . Show how this key would be used to encrypt the message “8”. (8)

Encryption exponent $E$	Product of primes $n=a \times b$
7	589

(8)

**Total Marks [25]**

- 6
- (a) Explain how PPP and SLIP can be used to create a Virtual Private Network (VPN). Outline the enhancements that PPP has over SLIP that allows for improved performance and security. (6)
  - (b) Explain how routers are used in a Novell NetWare network to provide services from NetWare servers to NetWare clients on interconnected networks. (6)
  - (c) The following shows an example of a `show ipx route` command. Explain the main elements of this listing. (7)

```
Myrouter > show ipx route
Codes: C - Connected primary network, c - connected secondary network, R - RIP, E
- EIGRP, S - Static, W - IPXWAN connected
5 total IPX routes

Up to 2 parallel paths allowed. Novell routing protocol variant in use

R Net 2B10 [8/1] via 2B20.0000.0c03.13d3, 40 sec, Serial1
  via 2B30.0000.0000.D101.aa11, 40 sec, Serial 0
C Net 2B30 (X25), Serial0
C Net 2B20 (HDLC), Serial1
C Net 2B40 (NOVELL-ETHER), Ethernet0
C Net 2B50 (NOVELL-ETHER), Ethernet1
```

- (d) Contrast CHAP and PAP, and outline how they would be setup on a router. (6)