

**NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY**

Faculty of Applied Sciences

**Department of Computer Science**

**JUNE EXAMINATIONS 2004**

**SUBJECT: Data Communications and Computer Networks**

**CODE: SCS 6103**

**INSTRUCTIONS TO CANDIDATES**

The question paper consists of seven (7) questions

Answer any 5 questions

**3 HOURS**

**QUESTION ONE**

- a) Give a brief description of the application and limitations of the following types of transmission media:
- i) Twisted-pair lines [2]
  - ii) Coaxial cable [2]
  - iii) Optical fiber [2]
  - iv) Microwaves [2]
- b) With the aid of sketches, explain the effect on a transmitted binary signal of the following:
- i) Attenuation [2]
  - ii) Limited bandwidth [2]
  - iii) Delay distortion [2]
  - iv) Line and system noise [2]
- c) Assuming that a PSTN has a bandwidth of 4000Hz and a typical signal-to-noise power ratio of 40dB, Determine the Maximum theoretical information (data) rate that can be achieved [4]

**QUESTION TWO**

- a) A series of 8-bit message blocks (frames) is to be transmitted across a data link using a CRC for error detection. A generator polynomial of 11001 is to be used. Use an example to illustrate :
- i) The FCS generation process [4]
  - ii) The FCS checking process [4]
- b) Outline the difference between asynchronous and synchronous transmission [4]
- c) With the Aid of diagrams, explain how clock synchronisation can be achieved using
- i) Bipolar encoding [4]
  - ii) Phase (Manchester) encoding [4]

**QUESTION THREE**

a) Explain the term Multiplexing, and hence give a brief description of:

- i) Frequency-division-Multiplexing (FDM)
- ii) Time -division-Multiplexing (TDM)
- iii) Statistical-time-division Multiplexing (STDM)

[10]

b) Assume a terminal is connected to a computer. Explain the two techniques that are used to achieve error control and flow control. Clearly outline the effect of each mechanism on the user of the terminal.

[10]

**QUESTION FOUR**

a) You are a network consultant and a client who is the manager of a corporate organisation request for your advice on the best Network (LAN) design to install in his organisation. The client is concerned with performance, bandwidth and cost issues. Write a report giving your advice attending to issues of equipment, software, topologies and bandwidth in relation to performance and costs. Make your own recommendations to the client.

[15]

b) Explain the fault detection method that is used with token ring LANs, Explain also how the reliability of LANs can be enhanced by the introduction of a redundant ring.

[5]

**QUESTION FIVE**

a) Describe the differences between a circuit switched data network and a packet switched data network. Clearly identify the effects on users of these networks.

[10]

b) What purpose do the following serve in LANS?

- i) Repeater
- ii) Bridge
- iii) Router
- iv) Gateway

[2]

[2]

[2]

[2]

**QUESTION SIX**

a) Explain the aim of the OSI reference model for open systems interconnection and outline the function of each layer.

[15]

b) Using a sketch show the interrelationship between OSI reference Model and TCP/IP suite.

[5]

**QUESTION SEVEN**

- a) A router is a device, which connects together a group of Local Area Networks (LAN). In a router which connects a 10 Mbps LAN to the internet over a T1 (1.544 Mbps) link, how much memory is needed so that on average, only 5% of frames are lost? Assume that both LAN and T1 frames are always 1500 bytes and that on average, they arrive 10 msec apart. [10]
- b) Produce a sketch showing the fields that make up the header of the TCP segment and explain the function of each field. [10]

**END OF QUESTION PAPER**

**GOOD LUCK**