

*Ollscoil na hÉireann, Gaillimh*  
*National University of Ireland, Galway*

GX 915

**Semester II Examinations, 2002/2003**

Exam Code(s)	<u>4BS2, 4EL3, 4EL4</u>
Exam(s)	<u>4<sup>th</sup> Science</u>
Module Code(s)	<u>4BS2-EP446, 4BS2-AX408, 4EL3-EP411-5, 4EL4 AX402-5</u>
Module(s)	<u>EP429: Networking/Internet</u>
Paper No.	
Repeat Paper	<u>Special Paper</u>
External Examiner(s)	<u>Professor E. Kennedy</u>
Internal Examiner(s)	<u>Professor S. G. Jennings</u>
	<u>Dr. J. Martin</u>

**Instructions:** Answer TWO questions.

Duration	<u>1½ hrs</u>
No. of Answer Books	<u>1</u>

**Requirements:**

Handout	<u></u>
MCQ	<u></u>
Statistical Tables	<u></u>
Graph Paper	<u></u>
Log Graph Paper	<u></u>
Other Material	<u></u>

No. of Pages	<u>2</u>
Department(s)	<u>Experimental Physics</u>

## EP429: Networking/Internet

- Q.1 Briefly define or explain the following terms as used in data networks: *LAN, MAC, Internet, WWW, Circuit Switching, Packet Switching, HDLC, Bridge, Router, Virtual circuit.*

[5 marks]

Write an account of Ethernet (IEEE 802.3) networking standards, including full descriptions of (a) the *CSMA-CD* protocol and (b) *Structured 100BASE-T* Ethernet. Explain why Structured Ethernet is the preferred LAN installation today.

[5 marks]

- Q.2 Give the layer details of both the *ISO/OSI 7-layer* and the *US DOD 4-layer Network Reference Models*, explaining briefly (a) what each layer does and (b) why such reference models are required in network design. State the main weaknesses of each model and hence sketch the *Compromise 5-layer Model*, which is often used in practice.

[4 marks]

List the main functions of both *TCP* and *IP* protocols in networking, and indicate where they are positioned in the reference models listed above.

[4 marks]

Illustrate briefly the mechanism of *TCP Flow Control*. State briefly what *CIDR* means, and say why it is increasingly necessary at present.

[2 marks]

- Q.3 Answer any TWO of the following.

[5 marks for each section]

- (a) Write a short description of *Block Error Codes, FEC and Hamming Codes*. Illustrate your answer with a worked (binary numerical) example of how a (7, 4) Hamming Code operates.
- (b) Briefly state the principle underlying *Huffman Coding* for data compression. An information source, *S*, produces symbols from a 6-symbol alphabet  $\{A\} = (A1, A2, A3, A4, A5, A6)$  with the following long-term average probabilities:

Symbol	A1	A2	A3	A4	A5	A6
Probability	0.10	0.15	0.05	0.25	0.15	0.30

Construct a Huffman Code for this source. Illustrate your code by sketching the relevant *Rooted Binary Tree*. Define and calculate the amount of *Data Compression* achieved by your code with respect to a fixed length binary code for  $\{A\}$ .

- (c) Discuss the topic of *Cryptography*. Include accounts of Symmetric and Asymmetric Key methods, with particular emphasis on the operation and advantages of the RSA (*Rivest, Shamir, Adleman*) cryptosystem.