GX2325

OLLSCOIL NA hEIREANN
THE NATIONAL UNIVERSITY OF IRELAND, GALWAY

SUMMER EXAMINATIONS 2000-2001

MASTERS IN INFORMATION TECHNOLOGY

CT502 COMPUTER HARDWARE AND COMMUNICATIONS

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Time allowed: THREE hours
Answer 5 questions. All questions carry equal marks
At least two questions must be answered from each section.
Please use a separate answer book for each section

SECTION A

Q1. (a) Describe, with the aid of a block diagram, the Von Neumann machine. (7)

(b) Describe how interrupts are dealt with in the instruction cycle. (7)

(c) Given the following Op Codes, use diagrams to show how the CPU instruction to add the numbers 2 and 5 is carried out.

0001_2 (1 hex) = Load AC from memory
0010_2 (2 hex) = Store AC to memory
0101_2 (5 hex) = Add to AC from memory (6)

Q2. Describe briefly, using diagrams where appropriate, any 3 of the following (20)

(a) Cache Memory
(b) Conditional Branch Handling in a CPU
(c) SCSI and P1394 Firewire External Interfaces
(d) RAID Architecture

Q3. (a) Compare and contrast RISC and CISC processors. (6)

(b) (i) Describe briefly sign magnitude representation in computer arithmetic, mentioning the 2 main problems associated with it. (4)

ii) Calculate the two's compliment binary representation of –7. (2)

(c) Calculate the 32 bit floating point representation of 1.31072×10^6. (8)

Q4. (a) Describe briefly, using truthtables, the following logic gates: (4)

(i) XOR

(ii) NAND

(b) (i) Draw the logic diagram and truth table for $\overline{(\overline{A} \text{ OR } B)}$ OR $\overline{(A \text{ AND } B)}$. (4)

(ii) Prove using Boolean algebra that the above logic can be replaced by a single logic gate. (6)

(c) Describe how a Decoder works and mention where it might be used in a computer system. (6)

SECTION B

Q5. (a) Describe in some detail the operation of the POTS (Plain Old Telephone System), focusing on its use for **voice** transmission. (9)

(b) Briefly describe the requirement for and operation of modem's to facilitate data transfer across the POTS. Explain also how K56 modems can deliver higher datarates than conventional modems. (5)

(c) The bandwidth requirements of domestic Internet users is constantly increasing. Briefly describe **and** evaluate some possible solutions. (6)

Q6. (a) Distinguish between error detection and error correction policies, outlining where each might best be used.

(5)

(b) In recent years, Ethernet LANs have greatly surpassed Token Ring LANs in popularity. Describe **and** compare the operation of **both** LAN standards and explain why network administrators are increasingly choosing the former.

(10)

(c) Write a brief note on the recent developments in wireless LANs.

(5)

Q7. (a) Outline the background to the development of the new IP protocol IPv6 and the role that it will play in the future development of the Internet.

(5)

(b) Many Internet applications utilise the transport-layer TCP protocol to provide effective data transfer. Describe in some detail how TCP provides this QoS (Quality of Service).

(10)

(c) The transfer of Multimedia data across the Internet is an increasingly important Internet requirement. What transport layer protocol is generally used and why?

(5)

Q8. (a) Network security is becoming an increasingly critical issue, requiring a multi-stranded strategy. Outline the principal threats and an overall security strategy.

(10)

(b) Describe **and** distinguish between Secret **and** Public Key algorithms, focusing on where each might be used in a security strategy.

(5)

(c) Briefly summarise the evolution of mobile telephony from 1st to 3rd Generation (3G) and outline the principal objectives of 3G.

(5)