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UNIVERSITI SAINS MALAYSIA

First Semester Examination  
Academic Session 2002/2003

September 2002

**CIT505 – Computer Systems and Networks**

Duration : 3 hours

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**INSTRUCTION TO CANDIDATE:**

- Please ensure that this examination paper contains **FOUR** questions in **FOUR** printed pages before you start the examination.
  - Answer **ALL** questions.
  - You can choose to answer either in Bahasa Malaysia or English.
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ENGLISH VERSION OF THE QUESTION PAPER

1. (a) Most of the new computer systems use UNICODE instead of ASCII in representing characters. Explain why this is happening. (3/100)
  - (b) Show all the steps involved in the following calculations:
    - (i) Convert  $2164.35_7$  into decimal.
    - (ii) Convert  $83.75_{10}$  into binary. (4/100)
  - (c) Consider the Boolean function  $Z = (A \text{ XOR } B) \text{ AND } (B \text{ OR } C)$ .
    - (i) Draw the logic circuit diagram.
    - (ii) What are the possible values of A, B and C that will result in  $Z=1$ ? (6/100)
  - (d) Assume the instruction word of a CPU is made up of 8-bit opcode and 24-bit operand fields.
    - (i) How many different instructions can this CPU use?
    - (ii) What is the maximum amount of memory (in MBytes) that can be supported by this CPU? (4/100)
  - (e) Why is it easy and fast to perform seek, read and write operations on a disk (i.e. floppy, hard disk or CD) but not on a tape? (3/100)
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2. (a) What is an interrupt? Briefly explain how it is used in a computer. What happens when multiple interrupts occur at the same time? (6/100)
  - (b) What is meant by cache 'hit', cache 'miss' and cache ratio? How does cache ratio affect the performance of the computer? (6/100)
  - (c) What is a Process Control Block (PCB)? Briefly describe its contents as well as how it's used by an operating system. (6/100)

- (d) Explain **three (3)** advantages and disadvantages when an operating system uses small storage allocation units. (6/100)
- (e) How does memory become fragmented and what are the consequences (if any)? Describe a method of overcoming fragmented memory. (6/100)
3. (a) What is the Internet Network Model? List the names of each layer in the model, in the order of Layer 1 until the last layer, and explain the roles of each layer in the model. (11/100)
- (b) A user is retrieving a file via FTP from a file server to his computer connected via Ethernet. Draw a diagram of the encapsulation process indicating names of relevant protocols used at the respective layers defined in the Internet Model, starting from the time the file server process sends the file to the time it reaches the Ethernet network. (8/100)
- (c) Give the English language definitions for the following acronyms:
- (i) IEEE
  - (ii) DTE
  - (iii) CSMA/CD
- (6/100)
4. (a) Two users wish to communicate with each other using wireless communication devices. Two types of devices, FDM-based and TDM-based are available.
- (i) State the definition for FDM and TDM.
  - (ii) Draw a diagram for each type of device to indicate how a full-duplex connection can be established between two users.
  - (iii) Given that a 16 level signal is used to send a signal through a FDMA channel with frequency 6 kHz. What is the channel capacity  $C$  in bps calculated based on Nyquist's Theorem for that channel?
  - (iv) State **three (3)** advantages of Statistical TDM over Synchronous TDM. (12/100)

- (b) A computer network uses twisted pair cable to interconnect PCs to the network hub.
- (i) What is the effect of untwisting the twisted pair cable strands on data transmission?
  - (ii) Give **three (3)** advantages of fiber optic cables over twisted pair cables for data transmission.
  - (iii) Given that the Engineering department uses a FDDI LAN with 4 PCs while the Accounting department uses an Ethernet LAN with 5 PCs. Fiber Optic cables will be used to connect each PC to other relevant devices within each LAN. Draw a diagram indicating the type of devices that are needed to enable machines in both LANs to send and receive information among each other within the LAN as well as between the Accounting and Engineering departments, while keeping the two LANs separated as subnetworks.

(13/100)