UNIVERSITI SAINS MALAYSIA

Stamford College

First Semester Examination
2004/2005 Academic Session
October 2004

External Degree Programme
Bachelor of Computer Science (Hons.)

CST102 – Introduction to Operating Systems & Data Communications

Duration : 2 hours

INSTRUCTIONS TO CANDIDATE:

- Please ensure that this examination paper contains **FOUR** questions in **SIX** printed pages before you start the examination.

- Answer **ALL** questions.

- On each page, write *only your Index Number*.

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1. (a) Determine whether the following statements are **TRUE** or **FALSE**:

   (i)   In a segmented system, a memory address has two parts: a segment number and a segment offset.

   (ii)   The turnaround time is influenced by the length of the time quantum.

   (iii) The Shortest Seek Time First algorithm minimises latency and thus gives the best overall performance, but suffers from poor fairness.

   (iv)   The multidrop network consists of multiple nodes connected by a single transmission line without beginning or end.

   (v)   The Carrier Sense Multiple Access (CSMA/CD) contention-based protocol is implemented in Ethernet and does not eliminate collisions but does reduce them.

   (10/100)

   (b) A computer contains four page frames. The following information are given:

Page Frame	Loading Time	Last Referenced Time	Reference Bit	Modified Bit
0	160	180	1	0
1	200	211	1	0
2	120	163	1	1
3	150	177	1	1

   The contents of which page frame would be swapped out if the following algorithm is used:

   - FIFO (First In First Out)

   - LRU (Least Recently Used)

   - MRU (Most Recently Used)

   (5/100)

   (c) (i)   What is trashing and list **two (2)** possible causes of thrashing?

   (ii) Given the following program which simulates the effect of changing page sizes in a demand paging system:

   - What does function `int find_page_in_memory(int req_word, int page_Size, int memory, queue<info> memori)` do?

   - Which memory allocation scheme is used in the program? Explain how it is implemented.

   (10/100)

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```
struct info{
    int page_frame;
    int page_num;
}
int PROGRAM = 460; int MEMORY = 200;

int   find_page_in_memory(int req_word,int page_Size,int
      memory,queue<info> memori)
{
    int quotient, pageframe, find, i=0, pno, hits=0;
    pageframe = memory/page_Size;
    quotient = req_word/page_Size;
    info dataType6;pno= req_word/page_Size;

    while(i<pageframe){
        dataType6=memori.front();
        if((pno==dataType6.page_num)&&(hits==0))
            return find =1;
        memori.pop();
        memori.push(dataType6);   i++;
    }
    return find =0;
}

void main()
{       :      //deleted
    page_Size = pageSize();
    int pf=0; pf=MEMORY/page_Size;
    queue<info> memory;
    for(int x=0;x<pf;x++){
        info dataType2;
        dataType2.page_frame=x;
        dataType2.page_num=x;
        memory.push(dataType2);
    }
    int counter=-1,miss=0,hit=0;   char namafail[10];
    int request_word; ifstream request;
    :              //deleted
    cout<<"\nPlease enter the request file name :";
    :              //deleted
    request.open(namafail);
    while(!request.eof()){
    request>>request_word;
    if(!(find_page_in_memory(request_word,page_Size,MEMORY,memor
    y))){
                miss++; counter=0;
                info dataType3, dataType4;

                dataType3=memory.front();
                dataType4.page_frame=dataType3.page_frame;
                dataType4.page_num=request_word/page_Size;
                :
                memory.pop();
                memory.push(dataType4);
    } else{
    int i =0; int pno =0;int hits=0; hit++;
    info dataType5=memory.front();
    info dataType6; pno= request_word/page_Size;
    while(i<pf){
        dataType6=memory.front();
        if((pno==dataType6.page_num)&&(hits==0))
            hits++;
        memory.pop(); memory.push(dataType6); i++;
    }      }
request_word=0;
}        }
```

2. (a) Identify one scheduling algorithm which is commonly used in interactive operating system. Why do you think it is used in such system?

(5/100)

(b) Given the following transitions between process states, indicate whether the transition is possible. If it is possible, give an example of one situation that would cause it.

   (i)   Run — ready

   (ii) Run — waiting

   (iii) Wait — run

   (iv) Run — terminated

(10/100)

(c) Given the following procedures for PRODUCER and CONSUMER, complete both procedures by entering semaphore variables at the correct locations and explain briefly the function of procedures P (__) and V (__).

```
PRODUCER
produce data
P (__)
P (__)
write data into buffer
V (__)
V (__)

CONSUMER
P (__)
P (__)
read data into buffer
V (__)
V (__)
consume data
```

(10/100)

...5/-

3. (a) What is a contiguous disk allocation scheme? State **one (1)** advantage and **one (1)** disadvantage of this scheme?

(5/100)

(b) Assume that the following is the list of request arriving at a movable-head drum for different sectors on different tracks:

Request List	
Track	**Sector**
0	1
0	3
1	4
2	4
2	0
4	0
4	2
4	4

Given that the drum has only 6 tracks, numbred 0 through 5, and each track has 5 sectors, numbered 0 through 4. Show how does the request is satisfied using rotational ordering in the most efficient way. (Assume transfer time is 1 ms, seek time is 5 ms, search time is 2 ms.)

(10/100)

(c) (i) What is the use of the Access Control Verification Module? Give **two (2)** examples of it.

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(ii) The following diagram represents a file structure for a Unix operating system. Answer the three questions below:

```
                                        include ─────────────────────┐
                                   dev ────────────┐                  │
                       ┌─────────────────── comp   │             math │
              ┌── reg                              dp             I/O
                405 ───────────────────────┐       lp             string
                411 ──────────┐             │       ppt
              │               │             │       tty
           place           │             │
                         grade          subr ──────────┐
                      ┌── subr                          │
                   │                                    │
                   sqrt                               sqrt
                   sun                                solver
                   quadratic
```
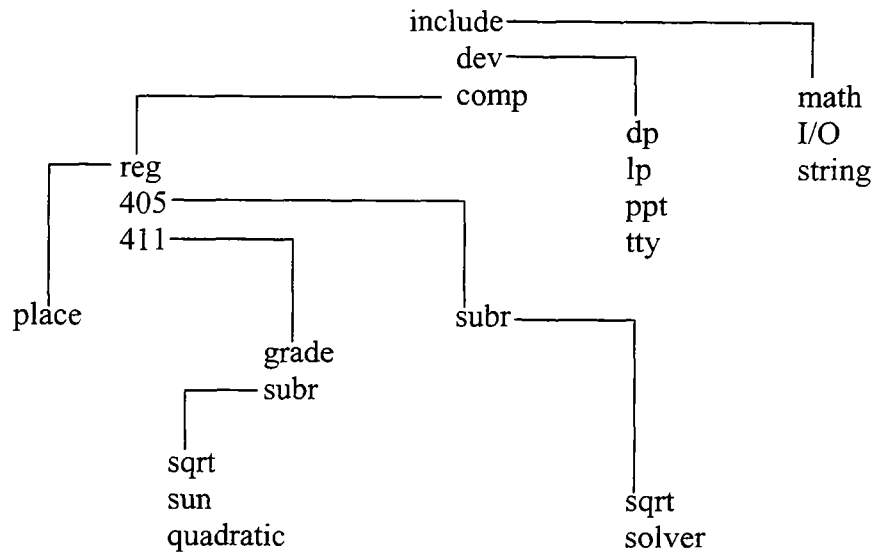
- Determine the type of the file structure of the above diagram.

- Write a command that will copy the file `solver` to a new name `solver_new`. Use the symbol ' / ' between names.

- What are the use of the files stored in `/include`?

(10/100)

4. (a) What is the OSI Layered Network Model? Briefly explain the role of Layers 3-5 in the model.

(10/100)

    (b) (i) What is internet and what is the relationship between internet and the World-Wide-Web?

         (ii) Give the English definitions for the following abbreviations and briefly state what it is used for.

              - HTTP

              - ICMP

(10/100)

    (c) List **three (3)** advantages and **two (2)** disadvantages of ATM (Asynchronous Transfer Mode).

(5/100)

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