EAST WEST UNIVERSITY BANGLADESH
Department of Computer Science & Engineering

CSE325: Operating System

Final term Examination **Spring 2015**

Total Marks: 50 Instructor: Dr. Md. Shamim Akhter Time: 120 minutes

Memory Management (5+5+5+5+10)

1. The **size command** in Linux prints the program's size in bytes with each of the text, data and BSS sections, along with the total size in decimal.

```
size a.out
text    data    bss     dec    hex    filename
1164    504      16    1684    694     a.out
```

However, if you exam the program's size with **ls-l**, will get the following results:

```
-rwxr-xr-x  shamim shamim      8377    April 3 13:32 a.out
```

Explain two (2) reasons: why does the program's physical size (@harddisk) differ with allocated memory size (@DRAM) after loading?

2. Process address space contains four (4) separate memory regions: code or text, global, heap and stack. Following table shows the regions and their starting memory address.

0	0x10000 0x10b64		0x20000 0x20cf0	0x20f68	0xeffffff
void	code	void	globals	heap->	<-stack

```
extern end;
extern etext;

int I;

main( int argc, char ** argv)
{
      int i;
      int *ii;
      printf("&etext=%p\n", &etext);
      printf("&end=%p\n",&end);
      printf("sbrk(0)=%p\n",sbrk(0));

      ii=(int *) malloc (sizeof(int));
}
```

   a. Write the value of &etext, &end, sbrk(0).
   b. Specify the memory regions of the following terms:

main	**i**	**argc**	**I**	**ii**

3. One of the design decisions in OS memory management is the choice between swapping and

paging. Define each of these terms, and clarify their respective roles in OS memory management.

4. Explain the difference between **internal** and **external** fragmentation. Which one occurs in **paging systems**? Which one occurs in systems using **pure segmentation**?

5. In pure **on-demand paging**, a page replacement policy is used to manage system resources. Suppose that a newly-created process has three (3) page frames allocated to it, and then generates the page references indicated below (bolded C & D are written and modified). Initially the frames are empty.

   A B **C** B A **D** A B C D A B A **C** B D

   a. How many page faults would occur with **LRU (stack)** page replacement?
   b. How many page faults would occur with **OPT** page replacement?
   c. How many page faults would occur with **Clock** page replacement?
   d. How many page faults would occur with **Second-chance cyclic** page replacement?

Concurrency: Deadlock and Starvation (10)

6. Consider a system that starts with a total of 150 units of memory, which is then allocated to three processes as shown in the following table of processes, their maximum resource requirements, and their current allocations:

Process	Max Demand	Currently Holds
P1	70	45
P2	60	40
P3	60	40
P4	60	

   Apply the banker's algorithm to determine whether it would be safe to grant each of the following requests. If YES, give an execution order that could be guaranteed possible. If NO, show the resulting allocation table.

   a. A fourth process arrives, with a maximum memory need of 60 and an initial request for 25 units.
   b. A fourth process arrives, with a maximum memory need of 60 and an initial request for 35 units

File Management and I/O Management (6+4)

7. The root directory contains an entry for each file whose name appears at the root of the file system. From the bellow information: generate the file creation time [22-23] and date [24-25], and the total file size (in bytes [28-31]).

```
0000 49 4f 20 20 20 20 20 20 53 59 53 27 00 00 00 00  IO      .SYS
0010 00 00 00 00 00 00 08 5d 62 1b 1d 00 16 9f 00 00
```

8. Differentiate POLLING and Interrupt - with a real life example.