CSC 718 -- Operating System Design
Final Exam

Answer all the questions. The maximum credit for each question is as shown.

1. (10) Explain interrupt systems. What processing (both hardware and software) need be done when an interrupt occurs?

2. (15) Explain segmentation with paging. What is dynamic address translation scheme used in segmentation with paging system.

3. (15) Describe the 5 directory structures and 2 directory implementation methods of a file system.

4. (15) Show below are 4 processes that are deadlocked. Also shown are the costs of killing each process. Find a way to resolve the deadlock with the minimum cost.

	Allocated			Request			Cost
	*R*1	*R*2	*R*3	*R*1	*R*2	*R*3	
P1	1	0	1	2	2	1	P1: C_1=4
P2	0	2	2	2	0	2	P2: C_2=5
P3	3	3	0	0	2	2	P3: C_3=10
P4	2	1	3	3	1	0	P4: C_4=9

Available Resource $V = (1,1,1)$

5. (15) Shown below is a page reference stream. Show the contents of the main memory if 4 page frames are allocated to this process and the page replacement algorithm used are (a) the Clock algorithm, (b) Least Recently Used algorithm (LRU).

   2 1 3 1 4 5 7 7 5 6 3 2 3 1 8 4 5 3 2 1

6. (15) Explain the RSA Public Key Encryption Scheme in detail. In particular, how do the encryption and decryption algorithms work? Explain also how you choose the public and private keys. Suppose a user picks n=11*7; i.e., p=11 and q=7. How should he pick the public key and the private key (i.e., d and e)?

7. (15) Suppose there is a data item that will be shared among several processes. The processes can be classified as Reader Process or Writer process. When a Writer process is using the data item, it will exclude any other process (Reader or Writer) from using it. On the other hand, if a Reader process is using the data item, it will only exclude a Writer process in using it, but allows another Reader process to use it. Show how this problem can be solved by the Wait(s) and

Signal(s) instructions. Give the code for the Reader and the Writer processes. Define any global variables and their initial values that you use.