Operating System

1. (15%) Please depict the state transition diagram for process. List three conditions under which the running process will release the CPU to others, and declare the final state of the running process under three conditions you gave respectively.
2. (10%) In addition to registers and program counter, please name one resource that cannot be shared by peer thread in a process. What is the reason that it cannot be shared?
3. (20%) A system has four processes and 12 identical resources. The maximum requirements and current allocations are shown in table below. The system employs the BANK algorithm in considering the deadlock effect. Now, some process issues a request of additional three resources. (a)If the request is issued by process 2, what is the system response? (b) same as previous, but it is process 3 which issues the request. (c)Process 4 issues the request, instead of process 2. (d)Which category this method belongs to? (deadlock prevention, deadlock avoidance, deadlock detection, deadlock recovery)

Process	Maximum	Allocation
1	7	2
2	6	1
3	11	4
4	2	1

4. (20%) Process P and Process C share two variables, *rx* and wx. Variable *rx* are only read by P and C, however, variable *wx* are written by P and C. Program of P and C are shown below.
   (a) Please identify critical region in the code.
   (b) To solve the critical region problem, one has to satisfy which three conditions?
   (c) By using shared semaphore, please modify the code to solve the critical region problem

Process P	Process C

Process P
int a, b, c, d;
...(code omitted)
a = rx;
wx = a+b;
c = wx;
d = rx;
wx = d-c;
...(code omitted)
	Process P
	int a, b, c, d;
	...(code omitted)
	a = wx;
	wx = b;
	c = rx;
	wx= c + b;
	...(code omitted)

5. (20%) There are five pages in a process, say 1,2,3,4 and 5. The reference string is a sequence of unlimited repeated string of 1 to 5, i.e., 1,2,3,4,5,1,2,3,4,5,1,2,3,4,5.... Please calculate the page

fault ratio under (a) LRU page replacement, (b) FIFO page replacement, and (c) optimal page replacement algorithms.

6. (15%) Which of the following is true for a paging system without the feature of demand page? Brief arguments are welcome besides a simple ‘Yes’ or ‘No”.
   (a) memory allocation scheme is very simple
   (b) has to pay the price of page fault
   (c) memory access time is quicker than the system without paging
   (d) MMU is a must in the system
   (e) no external fragmentation