MANIPAL UNIVERSITY JAIPUR

School of Computing & IT

IV Semester B. Tech Make up Examination	**July-2017**

CS 1401 Operating Systems Branch: CSE / IT /CCE

Solution

Duration: 3hrs **Max Marks: 80**

Notes: 1. Answer any **FIVE** full questions. Numbers in **[ ]** indicates marks.
2. Missing data, if any, may be suitably assumed. Course instructor shall not be called.
3. At most three units of bounded references are allowed.

Q 1. **a** **[8+4+4]**

Non Preemptive SJF

P1	P2	P4	P3	P5

0 10 11 12 14 19

Preemptive SJF

P1	P2	P3	P4	P5	P1

0 1 2 4 5 10 19

Priority

P1	P2	P1	P5	P3	P4

0 1 2 11 16 18 19

Round Robin (tq=2)

P1	P2	P3	P4	P5	P1	P5	P1	P5	P1

0 2 3 5 6 8 10 12 14 15 19

				SJF(NP)		SJF(P)		Priority		RR (tq=2)	
Process	Burst Time	Priority	Arrival Time	WT	TT	WT	TT	WT	TT	WT	TT
P1	10	3	0	0	10	9	19	1	11	9	19
P2	1	1	1	9	10	0	1	0	1	1	2
P3	2	3	2	10	12	0	2	14	16	1	3
P4	1	4	3	8	9	1	2	15	16	2	3
P5	5	2	4	10	15	1	6	7	12	6	11

2. **a** **[8]**

a. $32*2048 = 2^5 * 2^{11} = 2^{16}$
   Therefore, 16 bits are needed for the logical address.
b. $32 = 2^5$, therefore 5 bits are needed for logical address.
c. $8*2048 = 2^3 * 2^{11} = 2^{11}$, therefore 14 bits are needed for physical address.

d. By allowing two entries in a page table to point to the same frame in the memory, processes can share code and data

b **[8]**

Twenty bits are used for the virtual page numbers, leaving 12 over for the offset. This yields a 4K page. Twenty bits for the virtual page implies 2^20 pages.

Q 3. **[12]**

Given reference to the pages by a program as 1,2,3,4,5,3,4,1,6,7,8,7,8,9,7,8,9,5,4,5,4,2.
How many page faults will occur in OPTIMAL, FIFO and LRU page replacement policies, if the program has four page frames available to it?

Solution:-

FIFO:

F.no													
0	1	1	1	1	5	5	5	5	8	8	8	8	2
1		2	2	2	2	1	1	1	1	9	9	9	9
2			3	3	3	3	6	6	6	6	5	5	5
3				4	4	4	4	7	7	7	7	4	4
	F	F	F	F	F	F	F	F	F	F	F	F	F

Page Fault = 13

LRU ------------(4 marks)

F.no													
0	1	1	1	1	5	5	6	6	6	6	5	5	5
1		2	2	2	2	1	1	1	1	9	9	9	9
2			3	3	3	3	3	7	7	7	7	4	4
3				4	4	4	4	4	8	8	8	8	2
	F	F	F	F	F	F	F	F	F	F	F	F	F

Page Fault: 13

Optimal: ------------(4 marks)

F.no											
0	1	1	1	1	1	1	7	7	7	4	4
1		2	2	2	5	5	5	5	5	5	5
2			3	3	3	6	6	8	8	8	2
3				4	4	4	4	4	9	9	9
	F	F	F	F	F	F	F	F	F	F	F

Page Fault: 11

b **[4]**

Effective Access Time: Te = H * Tc + (1 – H) * Tm,
where Tc = 10ns, Te = 1.1 * Tc , and Tm = 200ns.
Thus, (1.1)(10) = 10H + (1 – H)200
11 = 10H + 200 – 200H
-189 = -190H
H = 189/190

4 **a** **[2]**

Consider the following snapshot of a system with five process (P1, P2, P3, P4, P5) and four resources (R1, R2, R3, R4). There is no current outstanding queued unsatisfied request. Answer the following using banker's algorithm.

	Allocation				**Maximum**				**Available**			
Process	R1	R2	R3	R4	R1	R2	R3	R4	R1	R2	R3	R4
P1	0	0	1	2	0	0	1	2	1	5	2	0
P2	1	0	0	0	1	7	5	0				
P3	1	3	5	4	2	3	5	6				
P4	0	6	3	2	0	6	5	2				
P5	0	0	1	4	0	6	5	6				

a) What is the content of matrix need?

b) Derive the safe sequence.
c) If the request (0, 4, 2, 0) for resources (A,B,C,D) respectively from process P1 arrives, Can the request be granted immediately.

Need Matrix is :-

Process	R1	R2	R3	R4
P1	0	0	0	0
P2	0	7	5	0
P3	1	0	0	2
P4	0	0	2	0
P5	0	6	4	2

b **[8]**

Safe Sequence is : P1-> P3-> P4-> P5-> P2

c **[6]**

No, if process P1 requests (0,4,2,0) for resources (A,B,C,D), it cannot be satisfied as the request is greater than its need.

Q 5. Disk requests come into the disk driver for cylinders: 10, 22, 20, 2, 40, 6, 38 in that order. The disk has 60 total cylinders and the disk head is currently positioned over cylinder 20. A seek takes 6 milliseconds per cylinder moved. What is the sequence of reads and total seek time using each of the following algorithms:- a) FCFS, b) SSTF, c) LOOK, d) SCAN **[16]**

Solution:

a)
First-come, first-served: 10, 22, 20, 2, 40, 6, 38 10 + 12 + 2 + 18 + 38 + 34 + 32 = 146 cylinders = 876 milliseconds.

b) Shortest Seek Time First: 20, 22, 10, 6, 2, 39, 40 0 + 2 + 12 + 4 + 4 + 36 + 2 = 60 cylinders = 360 milliseconds.

c) LOOK (initialing moving upwards): 20, 22, 38, 40, 10, 6, 2 0 + 2 + 16 + 2 + 30 + 4 + 4 = 58 cylinders = 348 milliseconds.

6 a Two processes X and Y need to access a critical section. Consider the following synchronization construct used by both the processes. Does the following solution satisfy entire three requirements of critical section problem? Justify your answer. **[8]**

```
Process X

while (true)  {

   varP = true;

   while (varQ == true)

   {   /* Critical Section */

      varP = false;

   } }
```

```
Process Y

while (true)  {

   varQ = true;

   while (varP == true)

   {   /* Critical Section */

      varQ = false;

   } }
```

Solution:

When both processes try to enter critical section simultaneously,both are allowed to do so since both shared variables varP and varQ are true.So, clearly there is NO mutual exclusion.
There is no bounded wait and progress.

	b	Write a Program to create two processes to run a loop in which one process adds all even numbers and the other adds all the odd numbers in a series of numbers from 1---20. (Hint: use fork ( ))	**[8]**

```
# include <stdio.h>

int main()
{
 int sum1=0,sum2=0,sum=0;
  int id,i;
 id=fork();
 if(id==0)
{
 for(i=0;i<20;i=i+2)
{
 sum1=sum1 + i;
}
printf("Parent Sum : %d\n",sum1);
 }
 else
 {
 for(i=1;i<20;i=i+2)
 {
sum2=sum2 + i;
 }
 printf("Child Sum : %d\n",sum2);
}
}}
```