Name of the Examination: 6th Semester CST Mid-Term Examinations, 2021

Name of the Subject: Operating System. Subject Code: CS 601

Date of Examination: 20-04-2021

Name of the Student _____

Examination Roll Number_____

G Suite ID_____ Number of sheets uploaded _____

Full Marks: 30 **Time: 45 min.**

- **Answer a maximum of 7 questions**. The full marks for the first 5 question is 30 while the rest of the questions gets you 22 only. So, the first 5 questions are quasi-mandatory.
- Both machine-printed and hand-printed answer scripts will be accepted.
- For figures, if any, draw it (No copy from any source) and import on your answer script
- **YOUR SIGNATURE MUST BE IMPORTED or handprinted** at the end of the script

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1. Five batch jobs. A through E, arrive at a computer centre at almost the same time.

JOB Name	Estimated run time
A	10
B	6
C	2
D	4
E	8

Find out the average turn-around time for (a) Round robin (time quanta 2 unit) (b) Priority scheduling (priority; 3, 5(H), 2, 1 (L), and 4 for A to E, respectively); (c) First-come, first-served (run in order 10, 6, 2, 4, 8). (d) Shortest job first. For (b) through (d), assume that only one job at a time runs, until it finishes. All jobs are completely CPU bound. [4]

2. Using *syscall* function Linux (X86-64) can write (1) or _exit (60) as shown in the following assembly language program segment – write the corresponding C program. [5]

```
;-----------------------------
.section .data
String:
.ascii “hello, world\n”
String_end:
.equ    len, string_end – string
.section        .text
,globl  main
        Movq    $1, %rax
        Movq    $1, %rdi        ; stdout has descriptor 1
        Movq    $string, %rsi
        Movq    $len, %rdx
```

```
Syscall
Movq    $60, %rax
Movq    $0, %rdi
Syscall
```

3. Consider the following program segment (assume that appropriate header files have been included) and find out the number of output lines for N = 28; provide a C program segment to find out the number of lines of output. [6]

```
int main() { int i;

  for(i=0; i<N; i++){
    fork();
    printf("Hello World\n");}
  return 0;}
```

4. The contents of IA-32 logical (Linear 32-bit) address 3013D5H is 5651E8D2H (in little endian form). Assume that; i) CR3 (Page directory base pointer) = 0344C000H ii) [0344C000] = 1CA6B867H
   Find the address of the PDE (Page Directory entry) and the address of PTE (Page table entry). If the PA = 19AC75D5H then find out the contents of the PTE and the contents of the physical address i.e., [PA].
   [Note each PTE entry is 4 bytes long] [8]

5. You are given the following data about a virtual memory system: (a)The TLB can hold 1024 entries and can be accessed in 1 clock cycle (1 nsec). (b) A page table entry can be found in 100 clock cycles or 100 nsec. (c) The average page replacement time is 6 msec. If page references are handled by the TLB 99% of the time, and only 0.01% lead to a page fault, what is the effective average address-translation time for 10000 clock cycles? [7]
6. Which function is used to reset the top of the heap in LINUX? [2]
7. In LINUX process address space implemented in 32-bit architecture wherefrom RO code segment and the stack segment start? [2]
8. Draw the process context switch diagram (Process A – made a disk read) process B is taking over and execution control returns to process A after the Disk interrupt on completion of the disk read. Diagram should clearly show the execution flow through the user and kernel code. [2]
9. While running a program in a UNIX system you have got the message “core dumped” … what do you mean by this message. Also, name at least 2 signals whose actions are “terminate and core dump”.
   [3]
10. Elaborate on the reasons for which thread synchronization is necessary [2]
11. Name the basic IPC mechanisms and their characteristics [2]
12. For solution to critical section problem a technique must satisfy three basic criteria. Name and elaborate them. [2]
13. What is a TLB and why is it used in a Paging mechanism?
    What are hard and soft TLB misses. [3]
14. Explain internal and external fragmentation. [2]
15. Draw the transition diagram of processes in a system considering ready, run and states. [2]

Signature of the student