National Institute of Technology Kurukshetra
END SEMESTER EXAMINATION May 2021
Question Paper
B.Tech. IV Semester (Computer Engineering)

Paper: **Operating Systems**
Course Code: **CSPC 20**
Number of Questions to be attempted: **6**
Total number of questions: **6**
Maximum Marks: **50**
Time Allowed: **2 hours**
Total Number of pages: **2**

Read following Instructions carefully before starting:
1. Draw diagrams if required.
2. Write answers on A4 register sheets using blue pen only in your own handwriting.
3. Sign top of each page, write Roll Number & Page Number. On page 1, you have to write the course code (CSPC20).
4. Keep Video On.
5. Scan all pages using Adobe Scan/ClearScanner/Similar Tool and email / hand-in / turn-in before 4:20pm. In emergency send by WhatsApp before turn-in time.
6. Email – mdave@nitkkr.ac.in and Mob: 7988761214 (WhatsApp)

1. Answer the following questions:
   (a) What are systems calls? How do they work?
   (b) Give three reasons for the system to select a new process to run.
   (c) How does context-switching affect the working of system using multiprogramming?
   (d) Why does real time scheduling requires different implementation strategy than non-real time scheduling?
   (e) After a process has exited, it may enter the state of being a Zombie before it is detected and removed by the operating system. Why this state is required? **(1.5 x 5)**

2. (a) Describe how interrupts are implemented.
   (b) Explain briefly process contention scope and system contention scope.
   (c) What is vfork() system call available in certain operating systems? Explain why the vfork() system call is more efficient than fork(). **(2.5, 3, 3)**

3. (a) What is busy waiting? Implement wait() and signal() operations for a system using the test_and_set() instruction. Explain how your solution is handling busy waiting.
   (b) Consider the parameter Δ used to define the working-set window in the working-set model. What is the effect of setting Δ to a small value on the page fault frequency and the number of active (non-suspended) processes currently executing in the system? What is the effect when Δ is set to a very high value? **(6, 4)**

4. (a) Consider a computer system with a 32-bit logical address and 4-KB page size. The system supports up to 512 MB of physical memory. How many entries are there in a single-level page table?
   (b) In a computer using paging, suppose there is an application that makes function calling resulting into the locality getting frequently changed for that process. Suppose the size of the new working set is larger than available free memory. What to do? **(4, 2)**

5. (a) Consider the following page reference string:
   1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6.
   How many page faults would occur for the FIFO page replacement replacement algorithm, assuming three frames per page? All frames are initially empty.
   (b) Consider a logical memory size: 1024 bytes in 4 pages. The physical memory has 16 frames. The page table entries are:

Page Number	Frame Number
0	5
1	2
2	7
3	0

   (i) What is the size of each page?
   (ii) What is the size of physical memory?
   (iii) Find physical address corresponding to logical address 597. **(3, 6)**

6. (a) What is swapping? If a process reads a large file, the blocks of the file will fill the virtual memory cache completely, flushing out all other contents. All other processes in the system then will have to go to disk for all their filesystem accesses. How to avoid this scenario?
   (b) Explain the differences between RAID 0, RAID 1, RAID 10 and RAID 01 along with necessary figures. **(3, 6)**

THE END