

**COL331/COL633**  
**OPERATING SYSTEMS**  
**MINOR-1**

**TIME: 1 HOUR**

**MARKS: 60**

**INSTRUCTIONS:**

1. All the questions are compulsory.
2. No doubts will be addressed during the exam. Make your assumptions.

**QUESTIONS:**

1. What are the advantages of dynamically loaded libraries? How do they save memory space (at runtime)? [10 marks]
2. Let us say that we want to switch between user-mode processes without flushing the *TLB* or splitting the virtual address space among user processes. How can we achieve this with minimal hardware support? [10 marks]
3. How does segmentation allow us to define per-CPU memory regions? Where are these regions (possibly) stored in the virtual address space? Why is this more efficient than other methods that rely on storing data at pre-specified locations on the stack? [10 marks]
4. Why are *idr* trees used to store *pid* structures? Why can't we use *BSTs*, *B-Trees*, and *hash tables*? [10 marks]
5. Consider the case of a *signal handler* - a function that is registered with the operating system that the OS needs to invoke when it needs to send a signal to a process. [4 x 5 marks]
  - I. The arriving signal causes a new function to run in the address space of a process by interrupting its execution. Should it use the same stack or a different stack? What are the pros and cons?
  - II. For the signal handler to take any effect, it needs to make changes to global variables. How should the programmer deal with such asynchronous events?
  - III. Can a graphical user interface that takes input from the mouse benefit from signal handlers?
  - IV. How is a signal handling function expected to complete? Where will it return to and how?