This exam is closed book. You can have one page of notes. UH expels cheaters.

1. Questions with Short Answers: (6×5 points)

   (a) Why would a process *interrupt itself*?

   ___________________________________________________________
   ___________________________________________________________

   (b) Why is *memory protection* always implemented in hardware?

   ___________________________________________________________
   ___________________________________________________________
   ___________________________________________________________

   (c) What is the purpose of the UNIX *signal()* system call?

   ___________________________________________________________
   ___________________________________________________________

   (d) In which *state* is a process waiting for the CPU?

   ___________________________________________________________

   (e) Which feature of UNIX made it *more portable* than previous operating systems?

   ___________________________________________________________

   (f) Why is it *easier* to write programs using kernel-supported threads than user-level threads?

   ___________________________________________________________
   ___________________________________________________________
   ___________________________________________________________
2. **Advantage and disadvantages:** you will get no credit if you answer mentions a disadvantage when an advantage is asked and vice versa. (6×5 points)

(a) What is the main advantage of all lightweight processes over regular processes?

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____________________________________________________________________________________

(b) What is the main disadvantage of monolithic kernels?

____________________________________________________________________________________

(c) What is the main advantage of multithreaded servers?

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____________________________________________________________________________________

(d) What is the main advantage of dual-mode processors?

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(e) What is the main advantage of microkernels?

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(f) What is the main advantage of symmetric multiprocessing over master/slave organizations?

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3. How many lines will this program print? (5 points)

```c
int main(){
    if (fork() == 0) {
        printf("Hello World!\n");
    } // main
    printf("Goodbye!\n")
}
```

Answer: ______ lines

4. What should the OS do when there is not enough free memory? (5 points)

_______________________________________________________________________________________
_______________________________________________________________________________________

Which processes are the best candidates for this action? (5 points)

_______________________________________________________________________________________
_______________________________________________________________________________________
_______________________________________________________________________________________

And the worst candidates? (5 points)

_______________________________________________________________________________________

5. Give examples of real-time processes with: (2×5 points)

(a) Hard deadlines: ________________________________________________________________

(b) Soft deadlines: ________________________________________________________________

6. How would you redirect the output of a program to the file logfile.txt? (2×5 points)

```c
fd = open("logfile.txt", O_WRONLY | O_CREAT, 0644);

close(fd);
```

T: ____
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fdesc = open("logfile.txt", O_WRONLY | O_CREAT, 0644);

____________________
____________________

close(fdesc);
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T: ___