Q 1.(5p) Define the operating System and give three example OS name:

Q2. (15×1p) Mark the following (T-F) questions using T for True, and F for False into the given table above. Note that a correct answer will get you 3 point. An incorrect answer will get you 0.25 negative points and a question left blank will get you 0 (zero) points.

Q2-1 (.....) Direct memory access (DMA) requires a special controller that facilitates the transfer of blocks between the I/O device and main memory.

Q2-2 (.....) A multi-threaded process has two program counters per thread.

Q2-3 (.....) The short-term scheduler controls the degree of multiprogramming.

Q2-4 (.....) Long-term scheduler (or job scheduler) selects which processes should be brought into the ready queue.

Q2-5 (.....) A child process can only be an orphan process while its parent can be either orphan or a zombie process.

Q2-6 (.....) When using fork system call parent and child process share only the data segment.

Q2-7 (.....) With NUMA, some parts of memory may take longer to access than other parts, creating a performance penalty.

Q2-8 (.....) CPU registers has faster access time than any other device including CPU cache memory.

Q2-9 (.....) Privilege escalation allows user to change file access permissions.

Q2-10 (.....) Emulation used when source CPU type different from the target type.

Q2-11 (.....) Operations in Message Passing architecture is faster than shared memory architectures.

Q2-12 (.....) Shared memory solutions lead to cache coherency problem.

Q2-13 (.....) Local variables of a process stored in the stack segment.

Q2-14 (.....) Text section of a program stores string-based variables.

Q2-15 (.....) Stack and Heap grows against each other.

Q3. (12×1p) Fill in the blanks with appropriate terms from the following list:

[try-catch, L3, system call, put, register, variable, program counter, copy, thread, assign, fetch-decode-execute, trap, linker, WAN, kthreads, L2, PAN, store, MAN, L1, SaaS, load, PaaS, IaaS, ls, stack, exception, linked lists, init, compiler]

a) A _____ or _____ is a software-generated interrupt caused either by an error or a user request.

b) When an interrupt occurs, the operating system preserves the state of the CPU by storing every _____ and the _____.

c) The _____ instruction moves a byte or word from main memory to an internal register within the CPU while the _____ instruction moves the content of a register to main memory.

d) The sequence of steps that the CPU follows to process instructions is called as _____ Cycle.

e) In the context of Cloud Computing Google Docs is an example for _____.

f) One of the example Shell program in Linux/UNIX systems is _____.

g) One method for system call parameter passing is to use _____.

h) PID value of 1 is assigned to the _____ process on Linux Systems.

i) _____ cache is shared among the CPU cores.

Q 4.(3p) Explain the difference between the core dump and crush dump.

Q 5. (3p) What is the disadvantages of using loadable Kernel modules?

Q 6. (10p) Considering the following code. (Note that fork returns positive value fort he parent, 0 for the child.)

a. Draw the process tree showing the value of a and b in each node of the tree.
b.How many times “3 4” and “4 5” is printed on the screen.(Assume that fork does not fail)

3 4: ..... 3 5: .....

```
int main() {
   int a, b;
   a = 3; b = 4;
   fork();
   if (fork())
      printf("%d %d\n", a++, b++);
   else
      fork();
   printf("%d %d\n", a, b);
   wait(NULL);
   return 0;
}
```

Q 7.(3p) Give an example scenario fort ask parallelism.

Q 8.(3p) What is mutual exclusion.

Q 9.(6p) Draw a directed graph representing the process state model. Name all edges and vertices.

Q 10.(5p) Write the manual compilation and linking steps to compile a Project having myproject.c , plib.c , plib.h files into test.exe using gcc compiler.(Assume that all files are in the same directory)

Q 11.(6p) Write the content of the IDL file "myrpc.x" that serves two functions named calculateArea and calculatePerimeter for a rectangle using RPC.

Q12. (8p) Suppose that a process is executing “counter = counter + 1” while another process is executing concurrently and independently “counter = counter - 2”, where the counter is a variable shared between the two processes and is accessed only by the two statements. Given that the value of counter is 6 before execution, the possible value(s) after both processes finish their statement are _____.

(Remember there are possibly MULTIPLE correct choices for this question.)

a. 4 b. 5 c. 6 d. 7 e. Error

Q 13.(6p) What is implicit and explicit threading? What are the known libraries for each of them?

Q14. (10p) The following algorithm is proposed to solve the critical section problem between two processes P1 and P2, where lock is a shared variable.

P1	P2

do {
  while (lock) { NULL; }
  lock = TRUE;
  critical section;
  lock = FALSE;
  remainder section;
} while (TRUE);
	do {
	  while (lock) { NULL; }
	  lock = TRUE;
	  critical section;
	  lock = FALSE;
	  remainder section;
	} while (TRUE);

Which of the following statements is true regarding the proposed algorithm? Mark the correct option(s).

i. Mutual exclusion to the critical section is guaranteed.

ii. Both processes can be in their critical section at the same time.

iii. Lock should be initialized to TRUE.

iv. None of the above.

Q15. (5p) If 20% of an application is serial, what will be the maximum speedup value?