5. [CO1] 1.a) Answer the following question: **[3 Marks]** 3 points

John, a college student, received a designing task on a project management software. To complete it, he used the windows operating system to open adobe illustrator. While he was reading the requirements from a microsoft doc, he received a prompt from an antivirus software. - Identify different types of softwares used by the user in this scenario and mention a few differences between them.

6. [CO1] 1.b) Answer the following question: **[2 Marks]** 2 points

What specific problem(s) of the monolithic structure were addressed through the adoption of a microkernel structure, and how were they resolved?

7. [CO1] 1.c) Find the output of the following code snippet. You need to type the answer in this form (as a response to this question) and show your working / tracing on paper. **Your output should exactly match with the original output. [3 Marks]** 3 points

```
int main(){
	int p=8;
	int q=4;
	i=fork();
	if(i<0){
		printf("fork failed\n");
	}
	else if(i==0){
		p=p+q;
		q=p-q;
	}
	else{
		wait();
		j=fork();
		if(j<0){
			printf("fork failed\n");
		}
		else if(j==0){
			q=p*q;
			p=q/p;
		}
		else{
			wait();
			p=q-p;
			q=p+q;
		}
	}
	printf("value of p: %d\n",p);
	printf("value of q: %d\n",q);

	return 0;
}
```

8. [CO1] 1.d) Answer the following question: **[3 Marks]** 3 points

In a significant research initiative addressing climate change, two pivotal groups play key roles: dedicated researchers who meticulously gather data from diverse sources, and skilled analysts responsible for employing advanced statistical models to derive actionable insights from this extensive dataset. To facilitate their collaboration, they have devised an effective approach for fluidly exchanging data and analysis instructions, thus enabling multiple analysts to work concurrently on this critical project.

Logically explain what type of communication method was used in the above given scenario.

9. [CO2] 2.a) Type the average waiting time and turnaround time in this form (as a response to this question) and show your calculation on paper : **[5 Marks]** 5 points

Draw a Gantt chart and illustrate the execution of the process using the **Round Robin** scheduling algorithm **(time quantum = 5 units)**. **Calculate** the **average waiting** and **turnaround time.**

Process ID	Burst Time	Arrival Time	Priority
P1	11	5	1
P2	10	3	5
P3	5	9	4
P4	14	11	222222
P5	6	15	3

10. [CO2] 2.b) Answer the following question: **[2 Marks]** 2 points

Due to a calculation error, P4 has received an abnormally high priority value compared to other processes. Describe the problem this situation might cause by providing a scenario illustrating the issue, and suggest how to address it.

11. [CO3] 3.a) Type the answer in this form (as a response to this question) and show your calculation on paper : **[3 Marks]** 3 points

A system has processes to execute of which are 92% parallel. The number of cores currently available is 3. Calculate the number of cores required in order to increase the speedup approximately 2.25 times.

12. [CO3] 3.b) Answer the following question: **[2 Marks]** 2 points

Imagine you have a text editor that is running on multiple threads and has a python code execution feature. To achieve the code execution, the editor creates a child process and loads the python interpreter as a separate program. In this scenario, should the child process be a single-threaded or multi-threaded program? State your reasons.

13. [CO3] 3.c) Answer the following question: **[2 Marks]** 2 points

In a manufacturing facility, raw materials are received and undergo multiple processes, including quality control, production, and packaging. All these processes rely on a shared database to track inventory and production progress. **Identify** which parallelism technique can be applicable here?

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