※答案須寫在答案卷內，否則不予計分。

1. Consider the following set of processes, with the length of the CPU-burst time given in milliseconds:

Process	CPU Burst Time
P_1	135
P_2	102
P_3	56
P_4	148
P_5	125

   The processes are assumed to have arrived in the order P_1, P_2, P_3, P_4, P_5, all at time 0.
   (a) Draw four Gantt charts illustrating the execution of these processes using SJF(Shortest Job First) and RR (Round Robin) (time quantum=40) scheduling. **(10%)**
   (b) What is the turnaround time of each process for each of the scheduling algorithms in question (a)? **(5%)**
   (c) What is the waiting time of each process for each of the scheduling algorithms in question (a)? **(5%)**

2. Page replacements are used to find the least page fault times. How many page fault times will be generated under the following page replacement strategies with 4 frames and the reference string- 1,2,3,4,1,1,2,4,5,1,2,3,3,4,1? (a)FIFO (b)LRU (c) Optimal Page-Replacement Algorithm. **(15%)**

3. Deadlock is possible if the four conditions are present simultaneously. What are the four necessary conditions? Please explain them. **(20%)**

4. Draw a figure to show all of the process's states while executing. **(15%)**

5. Please explain the internal fragmentation and the external fragmentation? **(15%)**

6. What are the differences between thread and process? **(15%)**