注意事項：

1. 本試題共 4 題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. Please explain the following terms (35 points)
   (1) **Response Time** (5 points)
   (2) **Throughput** (5 points)
   (3) **Data Hazard** (5 points)
   (4) **Control Hazard** (5 points)
   (5) **Delayed branch technique** (5 points)
   (6) Drawing a diagram and Giving a detailed explanation of **2-bit branch prediction technique** (10 points)

2. The IEEE 754 standard deals with the representation of floating point numbers in computers. (15 points)
   (1) Please explain why the biased notation is used in IEEE 754 standard. (5 points)
   (2) The bit pattern (1100 0111 1111 1001 0011 0000 0000 0000) is an IEEE 754 standard single precision floating point number. Please write down the related decimal number. (10 points)

3. The performance of a 1GHz processor P is measured by executing 100,000,000 instructions of benchmark code, which is found to take 0.25s. Find the MIPS and CPI for the processor P for this performance experiment. (10 points)

4.Please translate the following sentences into English or Chinese (40points)

(1)一種常用的方法去動態預測分支(branches)是記錄每次分支(branch)是否發生或是不發生，然後可以使用最近過去的行為來預測未來。(10 points)

(2) 如我們等下會看到的，大量類型的歷史紀錄，可以讓動態預測分支(branches)預測分支是否發生的正確率達90%。(10 points)

(3) When the guess is wrong, the pipeline control must ensure that the instructions following the wrongly guessed branch have no effect and must restart the pipeline from the proper branch address. (10 points)

(4) In our laundry analogy, we must stop taking new loads so that we can restart the load that we incorrectly predicted. (10 points)