所別：**通訊工程學系碩士班 通訊網路組** 科目：**計算機系統**

1. (12%) Please explain the following terms
    (1) (3%) Von Neumann bottleneck
    (2) (3%) FPGA
    (3) (3%) Sign extension
    (4) (3%) Branch delay slot (used to improve the performance caused by control hazard)

2. (15%) Data hazard
    (1) (5%) What is data hazard in a pipeline machine?
    (2) (10%) Will it happen in stack type instruction set architecture? Please use an example to explain it.

3. (18%) Suppose a load-store instruction type processor, 25% of the instructions are load/store type, runs at 500 MHz clock rate (2ns per clock cycle) with single level cache. The ideal CPI is 1.5 (without any hit miss at cache). However, the actual miss rate is 1% and the miss penalty is 60 cycles.
    (1) (6%) What is the actual CPI?
    (2) (12%) If we double the clock rate, however the "time" of miss penalty is not changed because the main memory access time is not improved, what is the speedup?

4. (5%) Please describe the advantage(s) of using two-level control memory model in microprogramming architecture.

5. (20%) Reliable communication
    (1) (5%) We know that IP network is not reliable, please describe what issues make it unreliable?
    (2) (10%) How does the TCP achieve the reliable connection over unreliable IP layer? And is TCP 100% reliable? Why?
    (3) (5%) Which kinds of traffic are NOT suitable to be transmitted over reliable connections? Why?

6. (21%) Internet
    (1) (7%) Please describe the principle of the Firewall and the functions performed by the Firewall.
    (2) (7%) What is proxy server? And what are its applications in network management?
    (3) (7%) Please compare dynamic domain name server (DDNS) and static domain name server.

7. (9%) What is mobile IP? And why do we need it?