# 0907432 Computer Design (Summer 2015)
## Quiz 1

الاسم:                       الرقم التسلسلي:                       رقم الشعبة:    1

=====================================================================================

**Instructions**: Time **20** minutes. Open book and notes exam. No electronics. Please answer all problems in the space provided and limit your answer to the space provided. **No questions are allowed**.

*<Good Luck>*

**Q1.** Assume that you have a typical 5-stage pipelined processor that uses forwarding and stalls to solve data hazards. Assume also that the add instruction in the following instruction sequence generates an exception in the execute stage and this exception is handled as soon as it is raised. Use the pipeline diagram below to find out how many cycles are needed by this processor to execute these instructions.

*[5 marks]*

| Address | Instruction | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---------|-------------|---|---|---|---|---|---|---|---|---|----|----|----|
| 00000060 | lw   $t0, 0($s1) | F | D | E | M | W | | | | | | | |
| 00000064 | add  $t0, $t0, $s2 | | F | D | D | E | n | n | | | | | |
| 00000068 | sw   $t0, 0($s1) | | | F | F | D | n | n | n | | | | |
| 0000006c | lw   $t0, 4($s1) | | | | | F | n | n | n | n | | | |
| | ... | | | | | | | | | | | | |
| 80000180 | sw $25, 80($0) | | | | | | F | D | E | M | W | | |

*Stalls and flushes are marked in red and forwardings are marked in blue arrows.*

**Q2.** The IC process manufacturing technologies continue to provide smaller and smaller transistors. Answer the following questions.

*[5 marks]*

(A) What happens to the speed of these transistors with time?

**They become faster**

(B) What happens to the number of transistors that can be manufactured on one chip of constant area?

**This number increases**

(C) How processor architects are using the new transistor budgets?

**To build chips with more cores and larger caches**

(D) What happens to the chip cost when the circuit complexity is doubled?

**The cost increases roughly with the square of the chip area**

(E) Compared with older transistors, do new transistors consume more or less dynamic power?

**Less dynamic power**