0907432 Computer Architecture and Organization 2 (Spring 2020)
<u>Quiz 1</u>

رقم التسلسل: رقم التسجيل: الاسم:

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Instructions: Time **15** 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.

P2. Assume that the 5-stage pipelined processor studied in the class resolves branch instructions in the execution stage and solves data hazards through forwarding and stalls. However, this processor does not have all forwarding paths needed. It has only the forwarding paths from the write back stage to the execution stage.

  a- Use the pipeline diagram below to show how this processor executes the instruction sequence shown. Use arrows to show the forwarding actions needed.

Instruction	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
add x1,x2,x3	F	D	E	M	W										
sub x4,x1,x5		F	D	D	E	M	W								
ld x1,0(x6)			F	F	D	E	M	W							
add x5,x1,x7				F	D	D	E	M	W						
blt x1,x8,Label					F	F	D	E	M	W					

  b- Perform code scheduling and register renaming to avoid all stalls of the above instruction sequence on this processor.

```
add  x1, x2, x3
ld   x10, 0(x6)
sub  x4, x1, x5
add  x5, x10, x7
blt  x10, x8, Label
```

<Good Luck>