

**N.B. Assignments are individual work, due as pdf format. Submit through avenue, by 30<sup>th</sup> September at 11:59 PM**

Assignment Question 1.1(5\*3=15Marks):

Consider three different processors P1, P2, and P3 executing the same instruction set. P1 has a 3 GHz clock rate and a CPI of 1.5. P2 has a 2.5 GHz clock rate and a CPI of 1.0. P3 has a 4.0 GHz clock rate and has a CPI of 2.2.

- Which processor has the highest performance expressed in instructions per second?
- If the processors each execute a program in 10 seconds, find the number of cycles and the number of instructions.
- We are trying to reduce the execution time by 30% but this leads to an increase of 20% in the CPI. What clock rate should we have to get this time reduction?

Assignment Question 1.2(5+2.5+2.5=10Marks):

Assume a 15 cm diameter wafer has a cost of 12, contains 84 dies, and has 0.020 defects/cm<sup>2</sup>. Assume a 20 cm diameter wafer has a cost of 15, contains 100 dies, and has 0.031 defects/cm<sup>2</sup>.

- Find the yield for both wafer.
- Find the cost per die for both wafers.
- If the number of dies per wafer is increased by 10% and the defects per area unit increases by 15%, find the die area and yield.

Assignment Question 1.3(5\*3=15Marks):

For each of the MIPS assembly code fragments in (a), (b), and (c), simulate execution starting in the “**Start state**” given below (written in hexadecimal notation) by writing down the new **register and memory state** after each instruction.

**Registers:**

a0	0000 0190
a1	0000 03E7
t0	0123 4567
t1	89AB CDEF
s0	1000 0000
s1	251F 326D

**Memory:**

1000 0000	0000 0000
1000 0004	0000 0000
1000 0008	0123 4567
1000 000C	89AB CDEF
1000 0010	0000 0000
1000 0014	0000 0000

a.

```
lw    $t0, 0 x8 ( $s0 )
lw    $t1, 0 xC ( $s0 )
add   $t0, $t0, $t1
lw    $t1, 0 x10 ( $s0 )
add   $t0, $t0, $t1
```

b.

```
addi  $s1, $s0, 0 x8
lw    $t0, 0( $s0 )
addi  $s1, $s0, 0 x4
lw    $t1, 0( $s0 )
add   $t0, $t0, $t1
addi  $s1, $s0, 0 x4
lw    $t1, 0( $s0 )
add   $t0, $t0, $t1
```

c.

```
lui   $t0, 0 xFEDC
ori   $t0, 0 xBA98
sw    $t0, 0( $s0 )
sw    $t0, 5( $s0 )
sw    $t0, 0 xA ( $s0 )
```