KV 2154

Q1

A

A[0]	x5	f	x8
B[0]	x6	g	x9
C[0]	x7	i	x10

① B[g] = A[i - 5A[32] + 32]

```
lw   x11, 128(x5)   // A[32] in x11
slli x11, x11, 2    // x11 *4
add  x11, x11, x11  // x11 + x11
addi x12, x10, 32
sub  x13, x12, x11
slli x13, x13, 2
lw   x14, x13(x5)
slli x15, x9, 2
sw   x14, x15(x6)
```

②

① f = g - A[B[C[64]]]

```
lw   x11, 256(x7)
slli x11, x11, 2
lw   x12, x11(x6)
slli x12, x12, 2
lw   x13, x12(x5)
```

kv2154

```
Sub x14, x9, x13
Sw  x14, x8
```

(ii) $f = g - A[C[16] + B[32]]$

```
lw   x11, 64(x7)
lw   x12, 128(x6)
add  x13, x11, x12
slli x13, x13, 2
lw   x14, x13(x5)
Sub  x15, x9, x14
Sw   x15, x8
```

(iii) $A[i] = 4B[8i - 81] + 4C[32i + 32]$

```
slli x11, x10, 3
addi x12, x11, -81
lw   x13, x12(x6)
slli x13, x13, 2
slli x11, x11, 2
addi x14, x11, 32
lw   x15, x14(x7)
slli x15, x15, 2
add  x16, x15, x13
slli x17, x10, 2
Sw   x16, x17(x5)
```

kv2154

3)

A)

IPC for PA = 10

Clock for PA = 500 MHz

MIPS = IPC x clock

= 10 x 500

∴ For PA = 5000 MIPS

B)

IPC for PB = 2

Clock for PB = 600 MHz

1)

B) reverse bits in register

```
lw x5, 0x12345678
lw x6, 0
lw x7, 0
lw x8, 31
loop:
andi x9, x5, 1
or   x6, x6, x9
slli x6, x6, 1
srli x5, x5, 1
```

kv2154

```
addi x7, x7, 1
blt  x7, x8, loop

mv x5, x6
```

p10

kv2154

3

A

IPC for A = 10

Clock rate for A = 500 MHz

MIPS = IPC x clock rate

= 10 x 500

MIPS for A = 5000 MIPS

B IPC for B = 2

clock rate for B = 600 MHz

MIPS for B = 1200 MIPS

C The performance between A and B cannot be compared as not enough information has been provided about the types of instructions being executed or the program that is to be run. It could be a case where B might have CISC like behaviour thus doing more tasks per instructions. But until and unless more information is Provided, We cant prove any performance metrics

KV2154

(4) $-1/4$, $-1/3$ in IEE 754

(1) $-1/4$ Sign -1, Exponen $= 2^{-2}$ = 125

1 01111101 00000000000000000000000

(2) $-1/3$ Sign $= -1$, Exponen $= 2^{-2}$, 125
Mantissa $= 1.33199997787$

10111110101010101010011001001100

(2)

1st Application = 80%
other = 20%.
Speed up = 2.

(A)

$$S = \frac{1}{(1 - F_{enhanced}) + \frac{F_{enhanced}}{Speedup_{enhanced}}}$$

$F_{end} = 0.4$

KU2154

$$S = \frac{1}{0.6 + \frac{0.4}{2}} = 1.25$$

(B)

$F_{enhanced} = 99\%$.

$$S = \frac{1}{0.01 + \frac{0.99}{2}} = 1.98$$

(C)

~~Speedup enhanced = 1.25~~

First on 80% resources

$$\text{SpeedupP} = \frac{1}{0.6 + \frac{0.4}{2}}$$

$$= 1.25$$

Now on 20% resources in serial

so $F_{enhanced} = 0$

$$\text{SpeedupS} = \frac{1}{(1-0) + \frac{0}{2}} = 1$$

KU215G

Now overall speedup

$$= \frac{1}{(0.2 * \text{speedupS} + 0.8 * \text{speedupP})}$$

$$= \frac{1}{(0.2 * 1 + 0.8 * 1.25)}$$

overall speedup = 1.19