Assignment 3_Report

Q4)

a. What decimal number does the bit pattern 0×0C000000 represent if it is a two's complement integer? An unsigned integer?

- The decimal representation of the given bit pattern is 201,326,592 and it will remain the same be it 2's complement or unsigned integer as the sign bit (MSB) is 0.

b. If the bit pattern 0×0C000000 is placed into the Instruction Register, what MIPS instruction will be executed?

- The binary value of the bit pattern is 0000 1100 0000 0000 0000 0000 0000 0000.
- The instruction register (J-Type) is shown below:

0 Opcode 5	6 Target 31
000011	00000000000000000000000000

- The first 6 bits are 000011 which is the opcode or jump and link instruction (jal) with target address as 00000000000000000000000000.
- Hence, when bit pattern is loaded in the instruction register it will interpret as a J type instruction and perform jump and link (jal) operation.

c. What decimal number does the bit pattern 0×0C000000 represent if it is a floating-point number? Use the IEEE 754 standard.

- The binary value of the bit pattern is 0000 1100 0000 0000 0000 0000 0000 0000.
- Here, the sign bit s is 0, Exponent e is 24, Bias is 127, Mantissa is 0.00000000000000000000000 which is equivalent to 0.0.
- The formula to convert this into a decimal number is

$$(-1)^{s} * (1+\text{Mantissa}) * 2^{(e - \text{bias})}$$
$$= (-1)^{0} * (1+0.0) * 2^{(24 - 127)}$$
$$= 1.0 * 2^{-103}$$

Q5)

a. Write down the binary representation of the decimal number 63.25 assuming the IEEE 754 single precision format.

- The binary representation of 63.25 is 00111111.01 which is equivalent to 111111.01
- It could be represented as $1.1111101 * 2^5$
- Hence, sign bit s = 0, exponent - bias (e – bias) = 5, Mantissa = 1111101, bias =127. Hence the exponent would be represented as e = 132
- Hence the binary representation of 63.25 in single precision floating-point format IEEE 754 is

0	1 2	9 10	31
0	10000100	11111010000000000000000	

b. Write down the binary representation of the decimal number 63.25 assuming the IEEE 754 double precision format.

- The binary representation of 63.25 is 00111111.01 which is equivalent to 111111.01
- It could be represented as $1.1111101 * 2^5$
- Hence, sign bit s = 0, exponent (e – bias) = 5, Mantissa = 1111101, bias =1023. Hence the exponent would be represented as e = 1028
- Hence the binary representation of 63.25 in double precision floating-point format IEEE 754 is

0	1 2	10 11	51
0	10000000100	1111101000000000000000000000000000000000000000000000	