

Embedded Systems

Lecture 22

UNC Charlotte, Department of Electrical and Computer Engineering
ECGR 4101/5101, Fall 2012, Quiz #18

①

Your name: Solution Show all work

1. Represent 1024.4375 in binary as a 64-bit floating number (double precision).

Single Precision

exponent 8 bits

$$127 + 10 \rightarrow 137$$

100 0000 0000, 0111

1000 1011

If you did this (but correctly) = 5 pts

0/1000 1001 / 0000 0000 0001 1100 0000 000

23

Double Precision

exponent 11 bits

$$1023 + 10 \rightarrow 1033 \rightarrow 1000000 1001$$

100 0000 0000, 0111

10

Name = 1 pt
Sign = 1 pt
exponent = 4 pts
mantissa = 4 pts

0/100 0000 1001 / 0000 0000 0001 1100

rest are

52 bits total

2. If the following code executes, what happens? Be specific.

```
float a, c;  
a = 1.2;  
c = a/0;
```

division by zero exception
some ISR
FP Flags set in FPSW

what should happen in your ISR?

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Ideas of what happens with a divide by zero fault: (in the ISR) ⁽²⁾

Keep $C = a/0;$
C the same

disregard?
Save all pertinent info?
stop & die?
notify someone?

Example:

Using single precision
Computing distance a vehicle travels
Using diameter, π , # revolutions

10,000 revolutions \rightarrow
accuracy of distance traveled

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What is π in single? double (3)

3.14159 \rightarrow 11,001-----

single exponent

1000 0000

double exponent

100 0000 0000

mantissa starts

1001.....

Use single vs double

1. Do you need the precision?
2. Can you afford the time & space needed

ie. Temp XX.X degrees C

-40.0 to 50.0 C	←	Float 32bits
-400 to 500	←	Integer 16bits