

2000 Paper 3 Question 10

Numerical Analysis I

The parameters for IEEE Double Precision are: $\beta = 2$, $p = 53$, $e_{\min} = -1022$, $e_{\max} = 1023$. Explain the terms *significand*, *sign bit*, *exponent*, *normalised number*, *denormal number*, *hidden bit*, *precision* as used in IEEE arithmetic. What values does the hidden bit have for normalised and denormal numbers? [8 marks]

In which order are the significand, sign bit and exponent stored? How is the exponent stored? Deduce how many bits are required to store the Double Precision exponent. How many bits are required to store a Double Precision number? [5 marks]

Deduce the meaning of the following Double Precision bit patterns (where dots indicate a number of zeros):

(a) 01111111111100...00

(b) 11000000000000...00

(c) 01111111111110...00

(d) 11111111111100...01

(e) 10000000000000...00

(f) 00000000000010...00

(g) 00111111111100...00

[7 marks]