

Mathematics for Computing

Numbers and Number Systems

Part 1 : Binary numbers

- (a) Express the following binary numbers as decimal numbers
 - (i) 11011
 - (ii) 100101
- (b) Express the following decimal numbers as binary numbers
 - (i) 6
 - (ii) 15
 - (iii) 37
- (c) Perform the following binary additions
 - (i) $1011 + 1111$
 - (ii) $10101 + 10011$
 - (iii) $1010 + 11010$

Part 2 : Hexadecimal numbers

- (i) Calculate the decimal equivalent of the hexadecimal number $(A2F.D)_{16}$
- (ii) Working in base 2, compute the following binary additions, showing all you workings
$$(1110)_2 + (11011)_2 + (1101)_2$$
- (iv) Express the recurring decimal $0.727272\dots$ as a rational number in its simplest form.

Part 3 : Base 5 and Base 8 numbers

- (a) Suppose 2341 is a base-5 number. Compute the equivalent in each of the following forms:
- (i) decimal number
 - (ii) hexadecimal number
 - (iii) binary number
- (b) Perform the following binary additions
- (i) $1011 + 1111$
 - (ii) $10101 + 10011$
 - (iii) $1010 + 11010$

Part 4 : Real and Rational Numbers

- (i) Express the recurring decimal $0.727272\dots$ as a rational number in its simplest form.

Miscellaneous Questions

- (i) Given x is the irrational positive number $\sqrt{2}$, express x^8 in binary notation.
- (ii) From part (i), is x^8 a rational number?