Assignment 1

**2.1 convert the following decimal numbers to equivalent binary numbers:**

|  |  |  |
| --- | --- | --- |
| (a) 43 | (b) 64 | (c) 4096 |
| (d) 0.375 | (e) 27/32 | (f) 0.4375 |
| (g) 512.5 | (h) 131.5625 | (f) 2048.0625 |

**2.2 Covert the following numbers to the equivalent binary numbers:**

|  |  |  |
| --- | --- | --- |
| (a) 14 | (b) 0.25 | (c) 218 |
| (d) 6.25 | (e) 238 | (f) 0.625 |

**2.3 Covert the following binary numbers to the equivalent decimal numbers:**

|  |  |  |
| --- | --- | --- |
| (a) 1101 | (b) 11011 | (c) 1011 |
| (d)0.1011 | (e) 0.001101 | (f) 0.001101101 |
| (g)111011.1011 | (h) 1011011.001101 | (i) 10110.0101011101 |

**2.4 Covert the following binary numbers to the equivalent decimal numbers:**

|  |  |  |
| --- | --- | --- |
| (a) 1011 | (b) 11000 | (c) 100011 |
| (d) 11011 | (e) 111001 | (f) 1011010 |

**2.5 Covert the following binary numbers to the equivalent decimal numbers:**

|  |  |  |
| --- | --- | --- |
| (a) 1011 | (b) 100100 | (c) 10011 |
| (d) 0.1101 | (e) 1.1001 | (f) 0.0101 |
| (g) 1011.0011 | (h) 1001.1001 | (i) 101.011 |

**2.6 Covert the following binary numbers to the equivalent decimal numbers:**

|  |  |  |
| --- | --- | --- |
| (a) 0.111 | (b) 0.11011 | (c) 1.011 |
| (d) 111.1011 | (e) 0110.0101 | (f) 101.101011 |

Assignment 2

**6.1 Add the following binary numbers:**

|  |
| --- |
| (a) 1110.1101 + 110101.01101 |
| (b) 1011011.111 + 1010110.1010 |
| (c) 110111.11 + 11011101.0101  **6.2 Subtract the following binary numbers. Assume that the binary numbers are represented in sign magnitude notation:**   |  | | --- | | (a) 10101.1010 - 10001.0011 | | (b) 11011.011 – 11110.101 | | (c) 1001000.001 – 1000011.011 | |

**6.3 Subtract the following decimal numbers Using 10’s complement representation for negative numbers:**

|  |
| --- |
| (a) 485 – 128 |
| (b) 684 – 35 |
| (c) 964 - 988 |

**6.4 Subtract the following binary numbers Using 2’s complement representation for negative numbers:**

|  |
| --- |
| (a) 10101 – 10001 |
| (b) 11011 – 1110 |
| (c) 100100 - 100011 |

**6.5 Subtract the following binary numbers Using 2’s complement representation for negative numbers:**

|  |
| --- |
| (a) 101101.0011 – 100101.0001 |
| (b) 11011.110 – 101.001 |
| (c) 10111.1001 – 11000.1101   * 1. **Multiply the following binary numbers using longhand multiplication:**  |  | | --- | | (a)10011 X 1101 | | (b) 110.101 X 1011.001 | | (c) 1101.101 X 110101.11 | |

* 1. **Divide the following binary numbers longhand:**

|  |
| --- |
| (a) 1011 / 011 |
| (b) 110111 / 1011 |
| (c) 110001.110 / 111.110 |

* 1. **Represent the following numbers using floating point notation. Assume 16-bit word:**

|  |
| --- |
| (a) 10110.1101 |
| (b) 1101100.10 |
| (c) 0.000011011011 |

* 1. **if a word has 32 bits, how many bits would you allocate for mantissa and exponent respectively? Explain your choice.**
  2. **Add the following binary numbers using 16-bit floating point representation:**

|  |
| --- |
| 1. 1011011.110101 + 110101.0101 |
| 1. 11011.1101 + 1011.10110 |
| 1. 0.000111 + 111.00111 |

* 1. **Subtract the following binary numbers using a 16-bit floating point representation:**

|  |
| --- |
| 1. 1011011.1101 - 01110.1101 |
| 1. 101110.110 - 1110.0011 |
| 1. 100110.101 - 011.110011 |

* 1. **Multiply the following numbers using a 16-bit floating point representation:**

|  |
| --- |
| 1. 1011.110 x 1010.110 |
| 1. 0.11011 x 0.111011 |

1. 1110111.111 x 11011.110

**6.13 Divide the following numbers using 16 – bit floating point representation:**

|  |
| --- |
| (i) 1011.110 / 1010/110 |
| (ii) 0.11011 / 0.111011 |
| (iii) 110111.111/11011.1101 |

Assignment 3

**3.1 Prepare a truth table for the following Boolean expressions:**

|  |  |
| --- | --- |
| (a) XYZ + X̅ Y̅ Z̅ | (b) ABC + AB̅C̅ + A̅B̅C̅ |
| (c) A (BC̅ + B̅C) | (d) (A + B) (A + C) (A̅ + B̅) |

**3.2 Prepare the table of combination for the following Boolean algebra expressions:**

|  |  |  |
| --- | --- | --- |
| (a) X̅ Y̅ + X̅ Y | (b)XYZ̅ + X̅Y̅Z | (c) X̅YZ̅ + XY̅ |
| (d)X̅Y̅Z̅ + XY̅Z̅ + X̅YZ̅ | (e) X̅Y̅ + Y̅Z̅ | (f) A̅B (A̅B̅C̅̅ + B̅C) |

**3.3Prepare a truth table for the following Boolean expressions:**

|  |  |
| --- | --- |
| (a) AB̅ + A̅B | (b) AB̅ + BC̅ |
| (c) AC̅ + AC | (d) A̅B̅C + ABC̅ + A̅BC |
| (e) AB (AB̅C + AB̅C̅ + ABC̅) |  |

**3.4 Prepare a table of combination for the following Boolean expressions:**

|  |  |
| --- | --- |
| (a)X (Y̅ + Z̅) + X Y̅ | (b) X Y̅ (Z + Y Z̅) + Z̅ |
| (c) [X (Y + Y̅) + X̅ (Y̅ + Y)]. Z̅ | (d) AB (A̅B + A̅B̅) |
| (e) A [(B̅ + C) + C̅] | (f) A̅B̅C̅ (A̅BC̅ + A̅B̅C) |

**3.5 Prepare a table of combinations for the following Boolean expressions:**

|  |
| --- |
| (a) XY + X̅Y̅Z |
| (b) ABC + A̅B + A̅B |
| (c) ABC + A̅C̅ |

**3.6 Prepare a table of combination for the following Boolean expressions:**

|  |
| --- |
| (a) AB̅C̅ + A̅B |
| (b) A̅B̅C̅ + AC + AB |
| (c) XZ + XY̅ + X̅Z̅ |

**3.7 Simplify the following expressions, and draw a block diagram of the circuit for each simplified expression, using AND and OR gates. Assume the inputs are from flip-flops.**

|  |
| --- |
| (a) AB̅C̅ + A̅B̅C̅ + A̅BC̅ + A̅B̅C |
| (b) ABC + A̅BC + AB̅C + ABC̅ + AB̅C̅ + A̅BC̅ + A̅B̅C̅ |
| (c) A (A + B + C) (A̅ + B + C) (A + B̅ + C) (A + B + C̅) |
| (d) (A + B + C) (A + B̅ + C̅) (A + B + C̅) (A + B̅ + C) |

**3.8 Simplify the expressions in question 3.4 and draw block diagram of gating networks for your simplified expressions, using AND gates, OR gates, and inverters.**

**3.9 Simplify the following expressions:**

|  |  |
| --- | --- |
| (a) ABC (ABC̅ + AB̅C + A̅BC) | (b) AB + AB̅ + A̅C + A̅C̅ |
| (c) X Y + X Y Z̅ + X Y Z̅ + X Z Y | (d) XY (X̅YZ̅ + X Y̅ Z̅ + X̅ Y̅ Z̅) |

**3.10 Simplify the expressions in Question 3.6 and draw diagrams of gating networks for your simplified expressions, Using AND gates, OR gates, and inverters.**

**3.11 Form the complements of the following expressions. For instance, the complement of (XY + XZ) is equal to (XY+XZ) = (X̅ + Y̅) (X̅ + Z̅) = X̅ + Y̅Z̅.**

|  |  |
| --- | --- |
| (a) (A + BC +AB) | (b) (A+ B) (B +C) (A +C) |
| (c) AB + B̅C + CD | (d) AB (C̅D +B̅C) |
| (e)A (B +C) (C̅ + D̅) |  |

**3.12 Complement the following expressions (as in Question 3.11):**

|  |  |
| --- | --- |
| (a) X̅ Y̅ + X Y̅ | (b) X Y̅ Z + X̅ Y |
| (c) X̅ (Y + Z̅) | (d) X (YZ̅ + Y̅Z) |
| (e) XY (Y̅Z + XZ̅) | (f) XY + X̅ Y̅ (YZ̅ +X̅ Y̅) |