Problem 1 (2 pts):
Convert the following IEEE floating point number into decimal. Show your work for full credit.

1 10000000 10101000000000000000000

Problem 2 (2 pts):
Given the following decimal numbers, complete the table with the respective 8-bit conversions.

<table>
<thead>
<tr>
<th>Decimal</th>
<th>2’s complement</th>
<th>1’s complement</th>
</tr>
</thead>
<tbody>
<tr>
<td>41</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-41</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Problem 3 (2 pts):
Show the result of the following operations.

(a) \((0110 \text{ AND } 1001) \text{ AND NOT(1110)}\)

(b) \(\text{NOT(1011 AND 1010) OR (0010 OR 1110)}\)
Problem 4 (4 pts):
Add the following 2’s complement numbers together. Show your work for full credit.

a) \(1010 + 010101\)

b) \(0100 + 110000\)

c) Why is sign-extension important when performing arithmetic with 2’s complement numbers?

d) For part (a), check your answer by translating the operands and results into decimal.

Problem 5 (3 pts):

a) In 2’s complement, how many distinct numbers can be represented using 16 bits?

b) What is the largest unsigned integer that may be represented using 16 bits?

c) What is the minimum number of bits is required to represent the number -135 in 2’s complement?

Problem 6 (2 pts):
For the following 8-bit 2’s complement numbers, perform the stated operation. Show your work for full credit.

(a) \(01110000 - 00101000\)
(
(b) 01010001 + 01010101

(c) Which of the above (if any) create overflow?

Problem 7 (2 pts):
Convert the following to their hex equivalent.
   a) The decimal number 21

   b) The ASCII string “cat” (do not include quotation marks)