

Hi all, This is the answer of quiz 1.

And some of you have found that there was a little flaw in one question(Radix conversion).

In radix 7, it will not have a digit 7. So the corrected question will be  $106.4_7$  instead of  $76.4_7$ .

For those who did not notice this issue still can calculate directly.

For those who affected by this flaw, please write an email to me.(asd99085@gmail.com)

Finally, due to the unfamiliarity with E3 system and imperfect of quiz restrictions, professor decide to let all of you have an extra non-score test.

In other words, If there are n quizzes, only the (n-4) highest scores are taken.

1. (30%+20%) Convert  $54.4_7 / 65.4_7 / 76.4_7 \rightarrow 106.4_7$  to binary and then to octal.

Hint: convert binary to octal by inspection.

**Ans:**

$$54.4_7 = 5 \times 7^1 + 4 \times 7^0 + 4 \times 7^{-1} = 35 + 4 + 4/7 = 39 \frac{4}{7}_{10}$$

$$\frac{39}{2} = 19 \dots 1 \Rightarrow \frac{19}{2} = 9 \dots 1 \Rightarrow \frac{9}{2} = 4 \dots 1 \Rightarrow \frac{4}{2} = 2 \dots 0 \Rightarrow \frac{2}{2} = 1 \dots 0 \Rightarrow \frac{1}{2} = 0 \dots 1$$

$$\frac{4}{7} \times 2 = 1 \frac{1}{7} \Rightarrow \frac{1}{7} \times 2 = \frac{2}{7} \Rightarrow \frac{2}{7} \times 2 = \frac{4}{7} \text{ (Repeat)}$$

$$54.4_7 = 100111.\underline{100}_2 = 100\ 111.\underline{100}_2 = 47.4_8$$

$$65.4_7 = 101111.\underline{100}_2 = 101\ 111.\underline{100}_2 = 57.4_8$$

$$76.4_7 \rightarrow 106.4_7 = 110111.\underline{100}_2 = 110\ 111.\underline{100}_2 = 67.4_8$$

2. (30%) Represent -9 and 6 / -11 and 4 / -13 and 2 as two 5-bit **1's complement** numbers, denoted by *a* and *b*, respectively.

(1) Please represent a, b, and (-b) in 5-bit 1's complement number.

(2) Calculate  $a - b$  by adding the complement of *b* to *a*. Hint:  $a - b = a + (-b)$

Indicate whether an overflow occurs and give it a short explanation.

**Ans:**

$$a = 10110, b = 00110, -b = 11001 / a = 10100, b = 00100, -b = 11011 / a = 10010, b = 00010, -b = 11101$$

$10110$	$10100$	$10010$
$+ \underline{11001}$	$+ \underline{11011}$	$+ \underline{11011}$
<b>(1) 01111</b>	<b>(1) 01111</b>	<b>(1) 01111</b>
$+ \underline{1}$	$+ \underline{1}$	$+ \underline{1}$
<b>10000 (-15)</b>	<b>10000 (-15)</b>	<b>10000 (-15)</b>
<b>No overflow /</b>	<b>No overflow /</b>	<b>No overflow</b>

(-) + (-) = (-) did not overflow. 5-bit **1's complement** numbers can represent  $15 \sim -15$ .

3. (20%) Represent  $741 / 852 / 963$  in excess-3 code.

**Ans:** (It must be 4 bits for each digit, and each digit/code should be separated like the answer below)

If all digits are connected together without space, five points will be deducted.

$$1010\ 0111\ 0100 \Rightarrow (7)\ (4)\ (1)$$

$$1011\ 1000\ 0101 \Rightarrow (8)\ (5)\ (2)$$

$$1100\ 1001\ 0110 \Rightarrow (9)\ (6)\ (3)$$