Homework No. 5 Solutions

1.

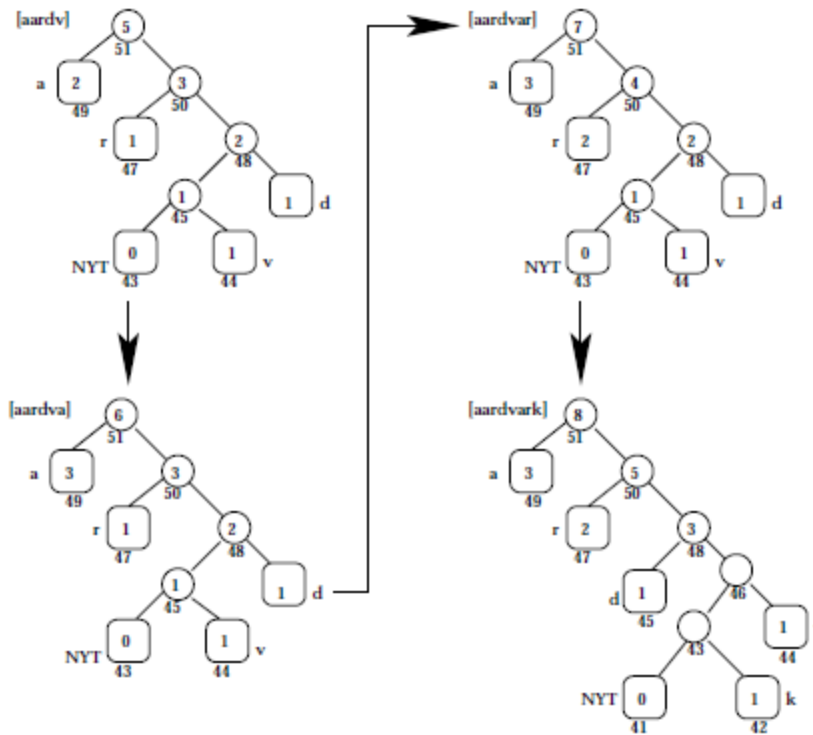### Problem 8.

Figure 4: Figure for Problem 8 in Chapter 3.

2.

Problem 5

Letter	Probability	cdf
a_1	.2	$F_X(1) = 0.2$
a_2	.3	$F_X(2) = 0.5$
a_3	.5	$F_X(3) = 1.0$

$$l^{(0)} = 0$$
$$u^{(0)} = 1$$

First letter is a_1

$$l^{(1)} = 0 + (1 - 0) \times 0 = 0$$
$$u^{(1)} = 0 + (1 - 0) \times .2 = .2$$

Second letter is a_1

$$l^{(2)} = 0 + (.2 - 0) \times 0 = 0$$
$$u^{(2)} = 0 + (.2 - 0) \times .2 = .04$$

1

Third letter is a_3

$$l^{(3)} = 0 + (.04 - 0) \times 0.5 = 0.02$$
$$u^{(3)} = 0 + (.04 - 0) \times 1.0 = 0.04$$

Fourth letter is a_2.

$$l^{(4)} = 0.02 + (.04 - 0.02) \times 0.2 = 0.024$$
$$u^{(4)} = 0.02 + (.04 - 0.02) \times 0.5 = 0.03$$

Fifth letter is a_3

$$l^{(5)} = 0.024 + (.03 - 0.024) \times 0.5 = 0.027$$
$$u^{(5)} = 0.024 + (.03 - 0.024) \times 1.0 = 0.03$$

Sixth letter is a_1

$$l^{(6)} = 0.027 + (.03 - 0.027) \times 0.0 = 0.027$$
$$u^{(6)} = 0.027 + (.03 - 0.027) \times 0.2 = 0.0276$$

Therefore a possible tag value is 0.0273.

3.

Problem 6. The tag decodes to the following sequence:

$$a_3a_2a_2a_1a_2a_1a_3a_2a_2a_3$$

4.

Problem 4.

Index	Codebook entry
1	a
2	$\text{\th}$
3	h
4	i
5	s
6	t
7	th
8	hi
9	is
10	$s\,\text{\th}$
11	$\text{\th}h$
12	ha
13	at
14	$t\,\text{\th}$
15	$\text{\th}i$
16	$is\,\text{\th}$
17	$\text{\th}hi$
18	$is\,\text{\th}h$
19	hat
20	$t\,\text{\th}i$
21	it
22	$t\,\text{\th}is$
23	$s\,\text{\th}h$
24	his
25	$s\,\text{\th}ha$
26	$at\_$

The decoded message is *this hat is his hat it is his hat*