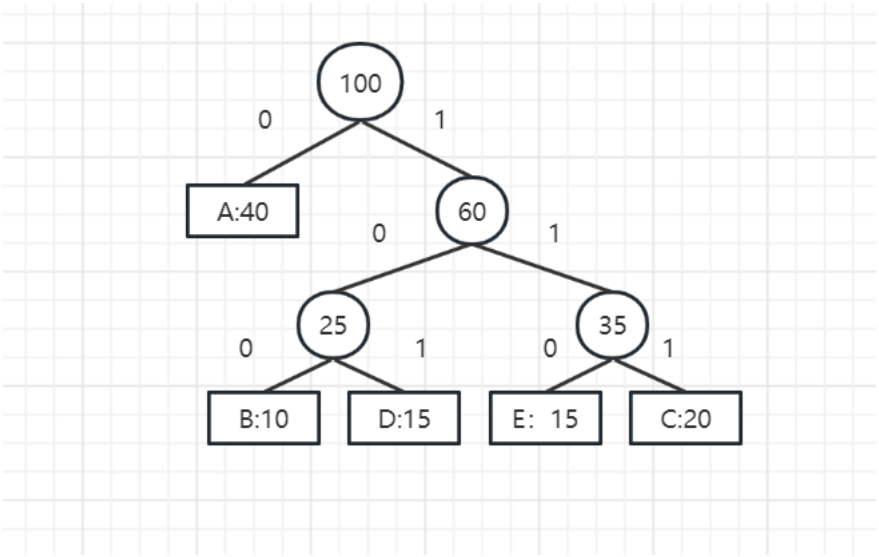
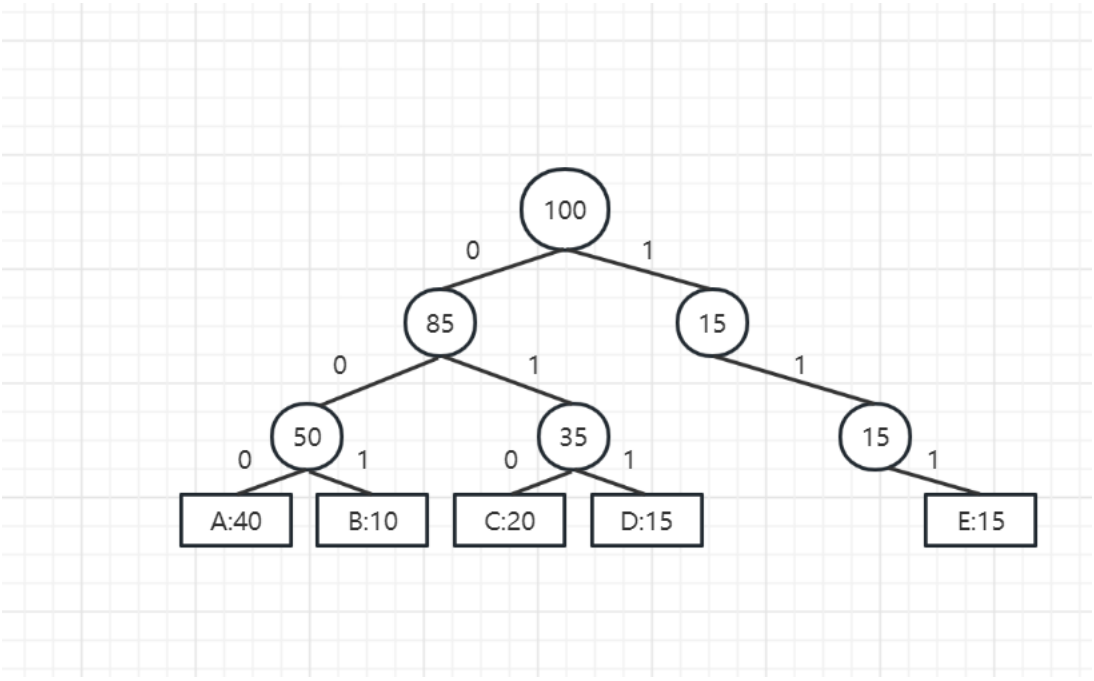
1. (a) Construct a Huffman tree (variable-length encoding) for the following [10 points]:



(b) Encode ABACABAD using the tree you generated for (a). [5 points]
0 100 0 111 0 100 0 101
(c) Decode 100010111001010 using the tree you generated for (a). [5 points]
BADEADA
(d) What compression gain (percentage of improvement) do we get by using Huffman encoding (variable-length encoding) instead of a fixed-length encoding scheme? Draw the tree for the fixed-length encoding. [5+10=15 points]



With fixed-length codes, 3 bits for each character=300,000 bits
Variable-length codes need (40*1+60*3)*1000 = 240,000 bits,20% savings
2. Use Dijkstra's algorithm to find the shortest path between vertices A and F. (Start at A, end at F). Show all the steps of your work. [15 points]

A	B	C	D	E	F	G
0	∞	∞	∞	∞	∞	∞
	1	3			10	
		2	8	6	10	3
			8	5	10	3
			8	5	10	
			7		7	
			7			

The shortest path between A and F is : A-B-C-E-F