Q1 Academic Honesty

1 Point

It is a violation of the Academic Integrity Code to look at any reference material other than your textbook and lecture notes, or to give inappropriate help to someone or to receive unauthorized aid by someone in person or electronically via messaging apps such as WhatsApp. Academic Integrity is expected of all students of Hacettepe University at all times, whether in the presence or absence of members of the faculty. Do NOT sign nor take this exam if you do not agree with the honor code.

Understanding this, I declare I shall not give, use or receive unauthorized aid in this examination.

Signature (Specify your name and surname as your signature)

Mehmet Taha USTA MTUSTA

While answering the following questions, please consider the implementations that we discussed in our lectures unless stated otherwise.

Q2 True/False Questions

20 Points

For each part, determine whether the statement is true or false.

Q2.1

5 Points

Given a sequence of symbols, the best compression ratio is achieved when the symbols are uniformly distributed within the sequence.

- ○ True
- ◉ False

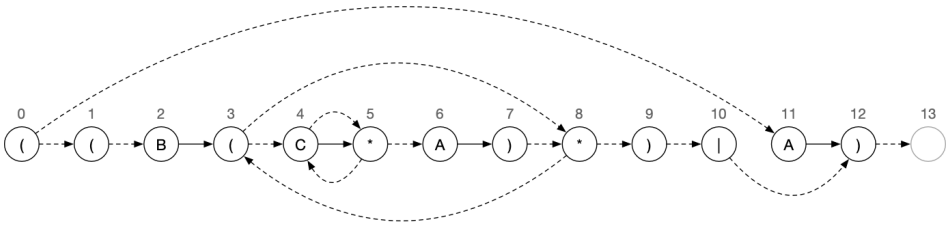
Q2.2
5 Points

In Huffman coding, the prefix codes should be uniquely decoded.

- (●) True
- ( ) False

Q2.3
5 Points

The NFA given below accepts the string BAACCC.



- ( ) True
- (●) False

Q2.4
5 Points

The NFA given in part 2.4 accepts the string BCCCACCA.

- (●) True
- ( ) False

Q3 Huffman encoding
15 Points

Which of the following codes could be the codes constructed by the Huffman encoding algorithm?

Symbol	Code I	Code II	Code III

Symbol	Code I	Code II	Code III
A	`00`	`011`	`01`
B	`11`	`110`	`10`
C	`100`	`0011`	`0001`
D	`011`	`1100`	`0010`
E	`010`	`1010`	`0100`

- [ ] Code I
- [ ] Code II
- [x] Code III
- [ ] Codes I and II
- [ ] Codes II and III

Q4 Regular Expressions

32 Points

Write a regular expression for each of the following sets of binary strings.

Q4.1

8 Points

ends with 00

```
^[01]*00$
```

Q4.2

8 Points

starts and ends with the same character

(.).*\1

Q4.3

8 Points

number of 0s is a multiple of 3

1*|(1*01*01*01)*

Q4.4

8 Points

doesn't contain the substring 110

((0|10)*1)*

Q5

18 Points

To compress the message "BAD_CAGED_BEAD_FADE", write down the required number of bits to encode the message.

Q5.1

4 Points

Number of bits required if we encode it with ASCII

152

Q5.2

6 Points

Number of bits required if we encode it with k fixed length codes (ignore the overhead for transmitting the codebook).

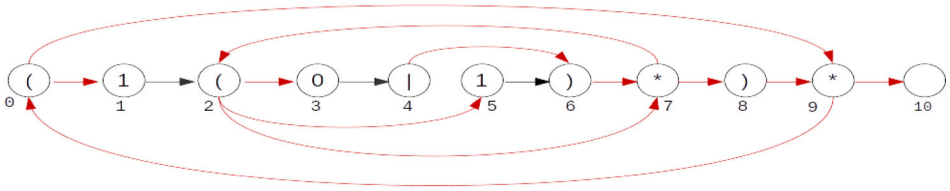
5

Q5.3
8 Points

Number of bits required if we encode it using Huffman Coding. Ignore the overhead for transmitting the trie.

4

Q6
15 Points



NFA for the regular expression $(1(0|1)*)*$ is given above, write down the reachable states for the following cases. Please write the state numbers as given in the figure, and separate each by only space character.

Q6.1
7 Points

Reachable states from start

Q6.2
8 Points

Reachable states after consuming 1

Quiz 6 - Regexps and Data Compression

GRADED

STUDENT
Mehmet Taha Usta

TOTAL POINTS
41 / 101 pts

QUESTION 1
Academic Honesty **1** / 1 pt

QUESTION 2
True/False Questions **20** / 20 pts

2.1	(no title)	**5** / 5 pts
2.2	(no title)	**5** / 5 pts
2.3	(no title)	**5** / 5 pts
2.4	(no title)	**5** / 5 pts

QUESTION 3
Huffman encoding **0** / 15 pts

QUESTION 4
Regular Expressions **16** / 32 pts

4.1	(no title)	**8** / 8 pts
4.2	(no title)	**0** / 8 pts
4.3	(no title)	**8** / 8 pts
4.4	(no title)	**0** / 8 pts

QUESTION 5
(no title) **4** / 18 pts

5.1	(no title)	**4** / 4 pts
5.2	(no title)	**0** / 6 pts
5.3	(no title)	**0** / 8 pts

QUESTION 6
(no title) **0** / 15 pts

6.1	(no title)	**0** / 7 pts
6.2	(no title)	**0** / 8 pts