

CHALMERS

EXAMINATION / TENTAMEN

Course code/kurskod	Course name/kursnamn			
DIT023	Mathematical Foundations for Software Engineering			
Anonymous code Anonym kod		Examination date Tentamensdatum	Number of pages Antal blad	Grade Betyg
DIT023 - 0015-JWG		25-08-2023	6	4

* I confirm that I've no mobile or other similar electronic equipment available during the examination.
Jag intygar att jag inte har mobiltelefon eller annan liknande elektronisk utrustning tillgänglig under examinationen.

Solved task Behandlade uppgifter	Points per task Poäng på uppgiften	Observe: Areas with bold contour are to completed by the teacher. Anmärkning: Rutor inom bred kontur ifylles av lärare.
No/nr		
1	1	4
2	2	2
3	3	19
4	4	15
5	5	5
6	6	18+5
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
Bonus poäng	2	
Total examination points Summa poäng på tentamen	70	

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1.1)

- a) When it is always false ✓
b) ~~Yes~~ No ✓
c) Yes ✓
d) No ✓
e) 7 ✓

h

1.2) $R(x)$ means ~~the~~ a professor wants his students to pass the exam

EX R(x) (part 1)

①

$$\forall x R(x) \quad (\text{part 2})$$

1, 3) $\frac{a \mid b \mid c \mid a \rightarrow b \wedge (c \vee b \rightarrow a) \vee b}{\quad}$

4

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2.1) ~~len~~ ea ✓ ①2.2) ~~AAA~~ $0^*(0|1)$ ① (doesn't include 2^0) but can represent any other 2^n

2.3) 2 1 1 1, 3 1 1 1, ①

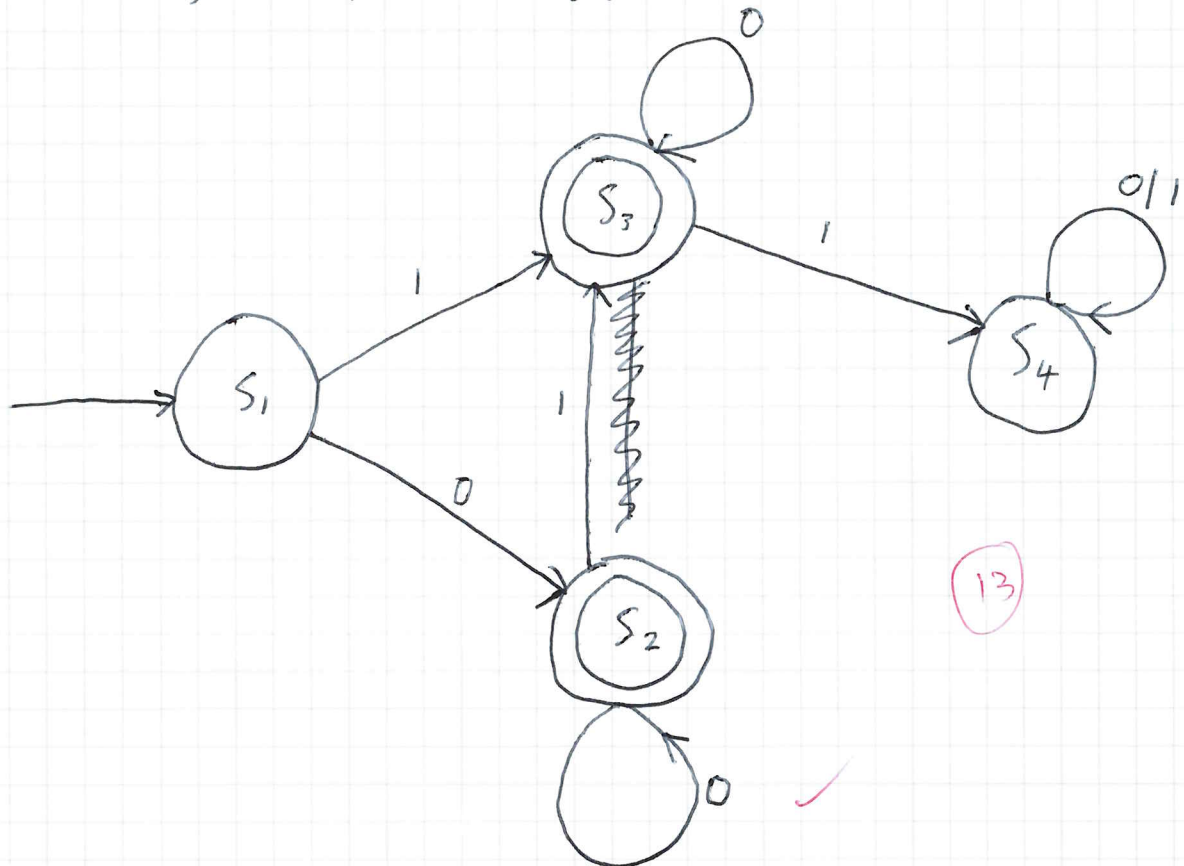
~~1.0~~

2pt

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3.1) ~~1B, 2A, 3C, 4D,~~~~1F, 2A, 3C, 4D, 5E, 6B~~

(6)

3.2) This is assuming by powers of two, you mean
 $2^0=1, 2^1=2, 2^2=4$ etc.

The automaton accepts 2^n for all positive integers of n in binary representation and also zero despite 0 not being a power of 2. I included it because it specifies this in the question.

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4.1) 3 0 8 1 6

m	t	s	a	l	o	start
a	t	s	m	l	o	3
a	l	s	m	t	o	0
a	l	m	s	t	o	8
a	l	m	o	t	s	1
a	l	m	o	s	t	6

5

4.2) The function runs twice only containing 1 comparison and no loops or iteration so the time complexity is constant $O(1)$.

5

4.3) ~~1/2~~

$$f(x) = \frac{(5x^{25})^2}{x^8 + 42} = \frac{25x^{50}}{x^8 + 42}$$

}

X

Without $g(x)$ I don't know how to solve this

4.4) 1 D, 2 C, 3 A, 4 E, 5 B

5

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5.1) Proof by example?

$$\begin{aligned} & 3(-18y^2 + 4y^2)x \\ &= 3(-14y^2)x \\ &= \cancel{X} - 42y^2x \\ &= \cancel{14} 7(-6y^2x) \end{aligned}$$

↑
7 easily divides this

(5)

6.1) ~~AC~~ BD / (5)

6.2)

6.2.1) ~~IGDAB~~ (4)

6.2.2) ~~CHE~~ CHEFJ (4)

6.3)

1) ~~Yes~~, since the p -values are below the significance value.
The chance of them occurring is low enough to be statistically significant

2) ~~Yes~~, you would only reject the null hypothesis if the experiment yielded ~~statistically~~ statistically significant results.

3) ~~No~~ because this was controlled for

4) ~~Yes~~

5) ~~No~~, it would not necessarily imply causation but it does signal a probable relationship between the 2 variables.

(5)
(+5)