CHALMERS
EXAMINATION / TENTAMEN

Course code/kurskod	Course name/kursnamn			
DIT-023	Mathematical foundations for software engineering			
Anonymous code Anonym kod		Examination date Tentamensdatum	Number of pages Antal blad	Grade Betyg
DIT023 - 834		2022-8-19	9	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 eximinationen.

Solved task Behandlade uppgifter No/nr		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.
1	X	6pt	
2	X	21pt	
3	X	17	
4		—	
5	X	15.5pt	
6	X	11pt	
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
Bonus poäng		0	
Total examination points Summa poäng		70.5	

5

CHALMERS | Anonymous code: DIT023-834 | Points for question (to be filled in by teacher) | Consecutive page no. Löpande sid nr 1 | Question no. Uppgift nr 1

1.1 a ✓

1.2 theres a typo in the exam
1.2 e ✓

1.3 a ✓

total 1: 6p

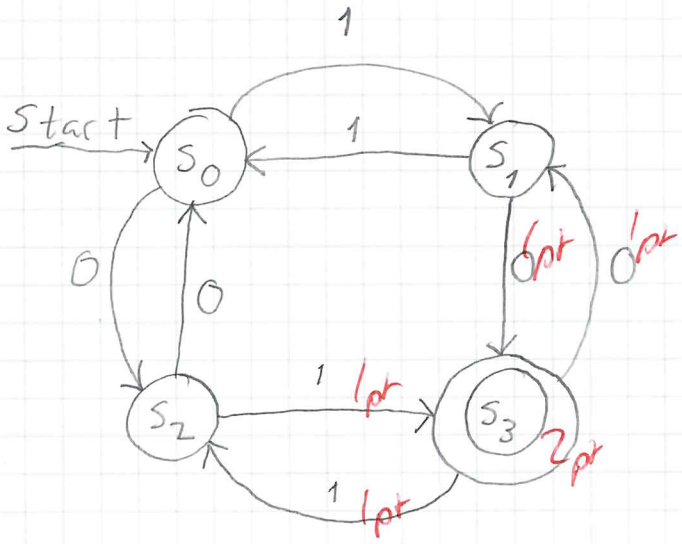
1.4 A a a a A ✓
B b b b B ✓
C c c c C ✓

CHALMERS | Anonymous code: DIT023-834 | Points for question (to be filled in by teacher) | Consecutive page no. Löpande sid nr: 2 | Question no. Uppgift nr: 2

2.1 e ✓ 1pt

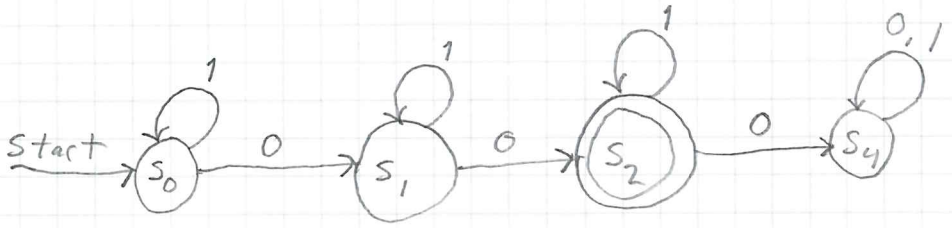
Total 2: 21

2.2



6pt

2.3



✓

14pt

CHALMERS | Anonymous code / Anonym kod: DIT023-834 | Points for question (to be filled in by teacher) / Poäng på uppgiften (ifylles av lärare) | Consecutive page no. / Löpande sid nr: 3 | Question no. / Uppgift nr: 3

total 3: 17

3.1

P	q	r	r → q	P → q	¬((((r ∨ q) ∧ ((r → q) ∧ P))) ↔ (P → q))
1	1	1	1	1	0
1	1	0	1	1	0
1	0	1	0	0	0
1	0	0	1	0	0
0	1	1	1	1	1
0	1	0	1	1	1
0	0	1	0	1	1
0	0	0	1	1	1

✓ 8pt

3.2 ¬p ✓ 1pt

3.3 ∈ ½ e 0pt

3.4

i) When it's never true ✓, also known as contradiction 0pt

ii) ½ 0pt

iii) See next page!

5

3.4

:)

meaning full compound proposition

q	r	s	$s \to q$	$(r \vee q) \wedge (s \to q)$	$\sim \vee (\neg q \to r)$
1	1	1	1	1	1
1	1	0	1	1	1
1	0	1	1	1	1
1	0	0	1	1	1
0	1	1	0	0	1
0	1	0	1	1	1
0	0	1	0	0	0
0	0	0	1	0	0

7pr ✓

as you can see the proposition is false in two cases meaning it's not a tautology.
tautologies are always true.

5

5.1 $O(n^3)$ ✓ 1pt

5.2 $O(n^2)$ ✓ 1pt

5.3 $O(n^2)$ ✓ 1pt

5.4

I will show the array after each iteration.

-1	3	15	-8	5	13	-1	9	19	-4	before
0	✓-8	15	3	5	13	-1	9	19	-4	
1	✓-8	-4	3	5	13	-1	9	19	15	
2	✓-8	-4	-1	5	13	3	9	19	15	
3	✓-8	-4	-1	3	13	5	9	19	15	8pt
4	✓-8	-4	-1	3	5	13	9	19	15	
5	✓-8	-4	-1	3	5	9	13	19	15	
6	✓-8	-4	-1	3	5	9	13	19	15	
7	✓-8	-4	-1	3	5	9	13	15	19	

5

5.5.1

0.5

$A = 1.25 \cdot \log(30000) = 5.60_5$ 5.59

$B = 5 \cdot 10^{-8} \cdot 30000^2 = 45.00_5$ 1pt ✓

$C = 5 \cdot 10^{-12} \cdot 30000^3 = 135.00_5$ 1pt ✓

5.5.2

algorithm C would be the fastest ✓ 1pt

5.6.1 0 ✓ 2pt

5.6.2 5 ↯

5.6.3 A → B, B → D, D → C ↯

5.6.4 false ↯

total 5: 15.5

5

6.1 1, 2, 3)

$y = \alpha + \beta x$

$\alpha = -1$

$\beta = 1$ (1)

$r = 1$

$\bar{x} = 19$

$\bar{y} = 18$

the standard error is missing occasionally!

$S_x = 15.19$

$S_y = 15.19$

Great! 3.5 pt

4) $y = -1 + 1x$

$7 = -1 + 1x \Rightarrow x = 8$

$15 = -1 + 1x \Rightarrow x = 16$

$y = 7$ corresponds to $x = 8$

$y = 15$ ~ $x = 16$

super 7pt

5

6.2

1)

null hypothesis: the mean values are equal for the groups 1pt

alternative hypothesis: at least one group has a different mean value. 1pt

2pt

5

6.4

null hypothesis: the provided data is insufficient to conclude a difference in variance. 1pt

alternative hypothesis: the data is sufficient to conclude that type B population has lower variance than type A population. 1pt

2pt