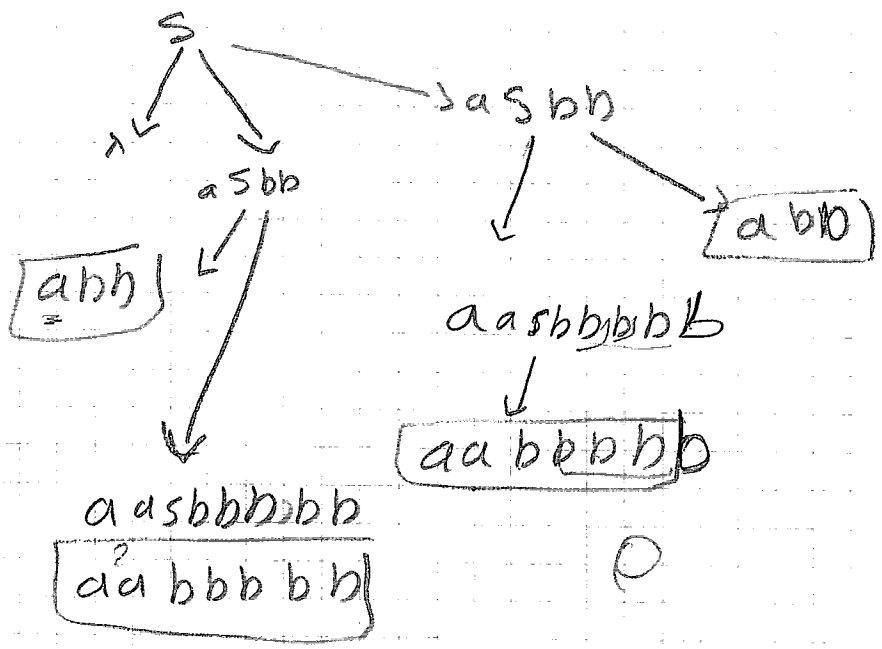
CHALMERS
EXAMINATION / TENTAMEN

Course code/kurskod	Course name/kursnamn			*
DIT022	matematisk grundkurs			Y
Anonymous code Anonym kod	768	Examination date Tentamensdatum	Number of pages Antal blad	Grade Betyg
			19	5

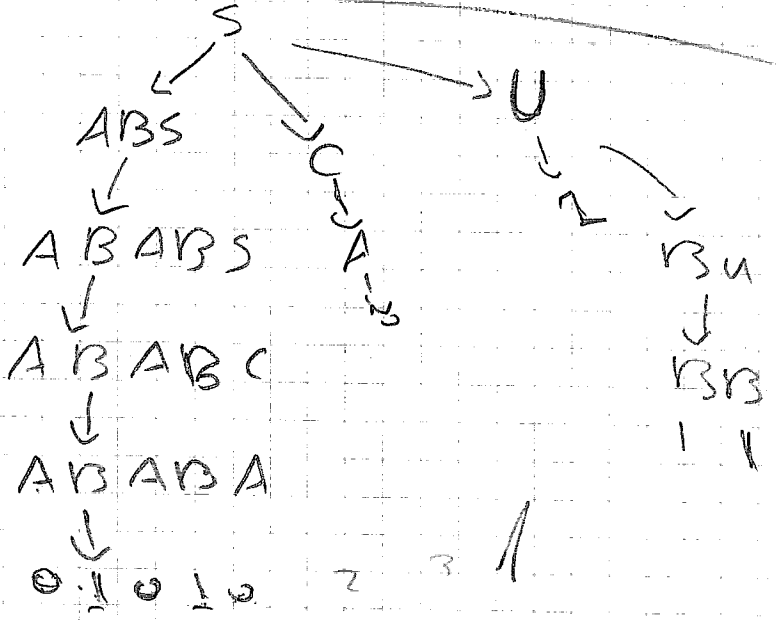
* I confirm that I've no mobile or other similar electronic equipment available during the examination.
Jag intygar att jag inte har mobiltelefon eller annan liknande elektronisk utrustning tillgänglig under examinationen.

Solved task Behandlade uppgifter 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	✓		
2	✓		
3	✓		
4	✓		
5	✓		
6	✓		
7	✓		
8	✓		
9	✓		
10	✓		
11	✓		
12	✓		
13	✓		
14	✓		
15	✓		
16	✓		
17	✓		
Bonus credits/ poäng	5		
Total examination points Summa poäng på tentamen	62+5=67		

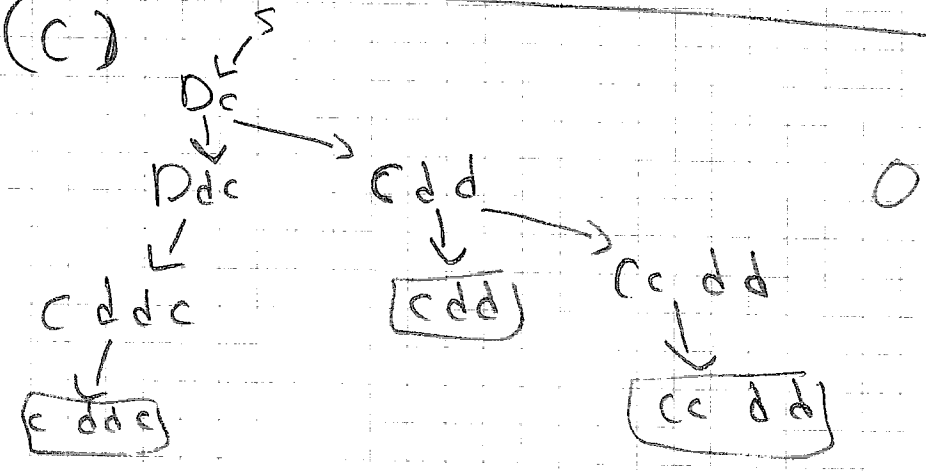
1.1(b)


S
λ
aSbb
aSbb
abb
aaSbbbb
aabbbb
aaSbbbbbb
aabbbbbb

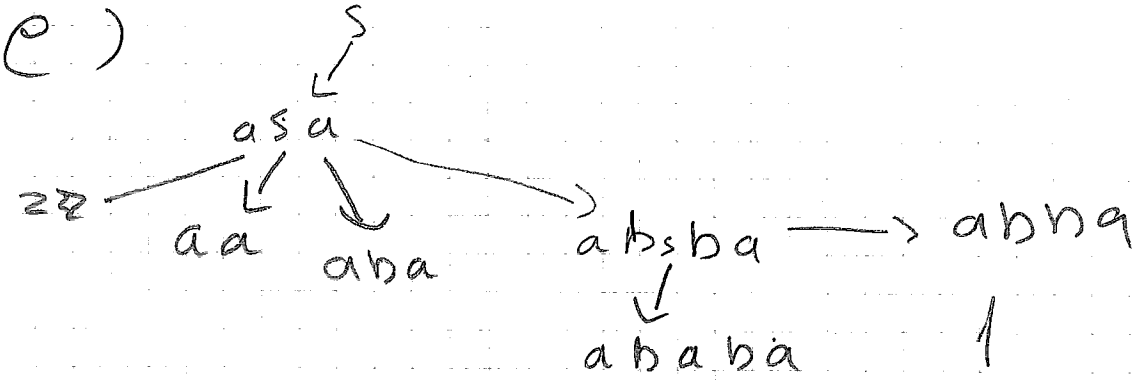
1.2(c)


S
ABS
C
U
ABABS
A
λ
BU
ABABC
BB
ABABA

1.3(c)


S
Dc
Ddc
Cdd
cddc
cdd
Ccdd
cddc
ccdd

1.4(e)



1

2.1.(a)

1

2.2(c)

1

3.2(c)

0

3.3(c)

0

2.1

1.5

Declaration

<type> <Declaration>

int <Decl>

int name

1 ABO

Declaration

<type> <Declaration>

<char> <Decl>

B <Decl> ''number''

B name ''number''

B Bergham '' 1 ''

B Bergham 1

1.6 1

AppExpr → Var | Bool

Var → and | why | where

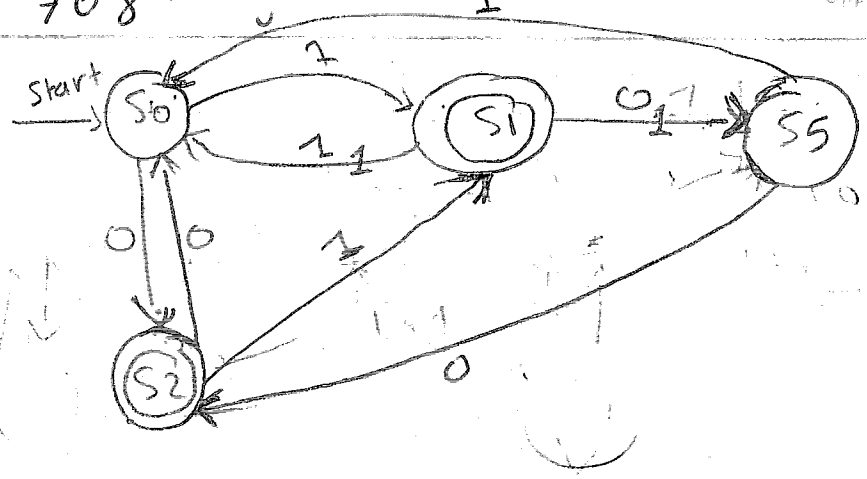
Bool → true | false

1, Atomic → Number | Var

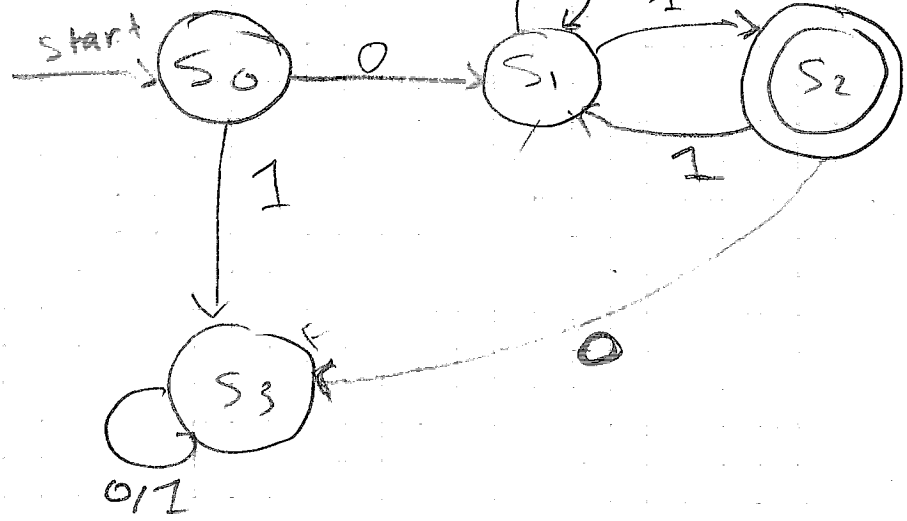
number → 1 | 2 | 3 | 4 ---- ,

dito22 768

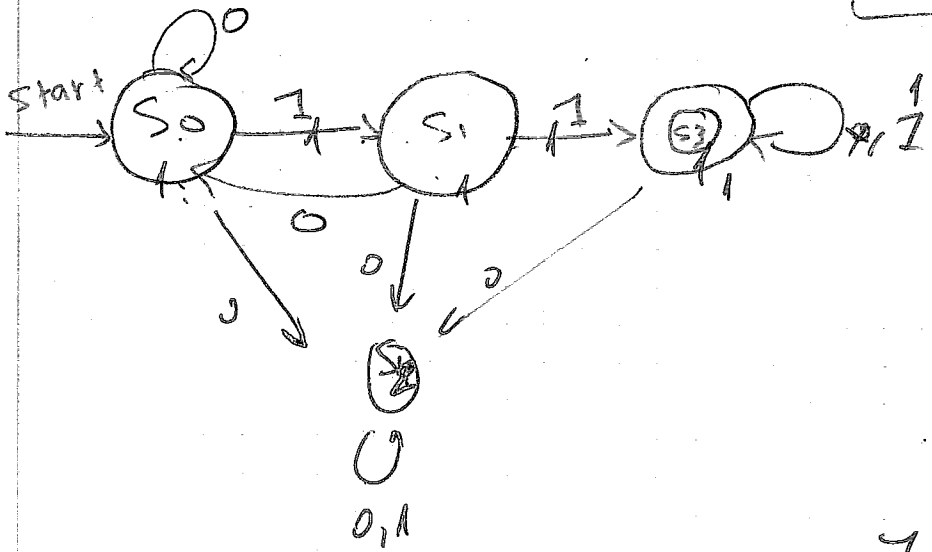
2.3



2.4



2.5



0 1 1

0 1 0 1

0 0 0 1 1 0 0

1 1 0 1 0

0 1 0 1 0 1 1

7/

3.4 6

i) the tautolgy is the compound proposition that give us always true
1

ii).

p	q	-p	-q	r	-r	(p → q)	-q → -p	(p→q) → (-q → -p)
1	1	0	0	0	1	1	1	1
1	0	0	1	1	0	0	0	1
0	1	1	0	0	1	1	1	1
0	0	1	1	1	0	1	1	1

r ∧ -r	(-q → -p) ∧ (r ∧ -r)	(p → q) → (-q → -p) ∧ (r ∧ -r
0	0	0
0	0	1
0	0	0
0	0	0

We can see that compound propstion has a true value which it can be contradication (it should be all true value is False.

iii) $(p \rightarrow q) \rightarrow (-p \rightarrow -q) \rightarrow (r \wedge -r)$

3.1. 3

$2^3 =$

m	n	L	m ⟷ n	-n	(-n ∨ m)
1	1	1	1	0	1
1	1	0	1	0	1
1	0	1	0	1	1
1	0	0	0	1	1
0	1	1	0	0	0
0	1	0	0	0	0
0	0	1	1	1	1
0	0	0	1	1	0

(m ⟷ n) ∧ (-n ∨ m)	-m	(-m → L)	(m ⟷ n) ∧ ((-n ∨ m) → (-m → L))
1	0	1	1
1	0	1	1
0	0	1	1
0	0	1	1
0	1	1	1
0	1	0	1
0	0	1	1
0	1	0	1

dit022 7688

4.2

for basic case $n = 2$

$4 + 3 < 2^4$ // $n=4$

$7 < 16$

let n = nonnegtive integers $n = k$ ✓1

$2k + 3 < 2^k$

$P(k+1)$: $2(k+1) + 3 < 2^{(k+1)}$ ✓1 — 1 for induction

$2k + 2 + 3 < 2^{k+1}$

$2k + 5 < 2^{k+1}$

$2 \cdot 2^k = 2k^2$ //

$2k + 5 < 2 \cdot 2^k \mid :2$

$k + \frac{5}{2} < 2^k$

$2\boxed{k} + 5 < 2\boxed{k^2}$

We can see that k^2 will allways be bigger than $k < k^2$ = $\boxed{k < k^2}$

3/

4.1

case ① $P(1) = n = 1$ ✓1

$3^2 - 1 = 9 - 1 = 8$

$\frac{8x+1}{\sqrt{8x+1}}$

case $P(k) = k^2 - 1 = 8x \rightarrow x \in \mathbb{Z}$

✓1 $k^2 = 8x + 1$

$k =$

$k^2 = 8x + 1$

$k = \sqrt{8x+1}$

$P(k+1) = (k+1)^2 - 1$

✓1 $(\sqrt{8x+1} + 1)^2 - 1$

$= 8x + 1 + 2\sqrt{8x+1} + 1 - 1$

$= 8x + 1 + 2\sqrt{8x+1}$

$= 8x + 1 + 2\frac{8x+1}{\sqrt{8x+1}}$

$= 8x + 1 + \frac{2 \cdot 8x + 2}{\sqrt{8x+1}}$

$= 8x + \frac{\sqrt{8x+1} + 2 \cdot 8x + 2}{\sqrt{8x+1}}$

$= 8x + \frac{\sqrt{8x+1} + 16x + 2}{\sqrt{8x+1}}$

We can see that the first term is divisible by 8 and the second term is one of 8.

3

5

5.1. $\in O(n)$ ○ 1/

5.2 (

$O(n)$
$O(n-1)$
$O(n^2 \times n) \circ (1)$
$= O(n^3)$
which is gives $O(n^3)$ 1

$O(n-1) \circ (n)$
$O(n^3)$
$O(n)$

5.3

6

16 21 45 8 11 53 3 26

0 1 2 3 4 5 6 7

1) 3 21 45 8 11 53 16 26

2) 3 8 45 21 11 53 16 26

3) 3 8 11 21 45 53 16 26

4) 3 8 11 16 45 53 21 26

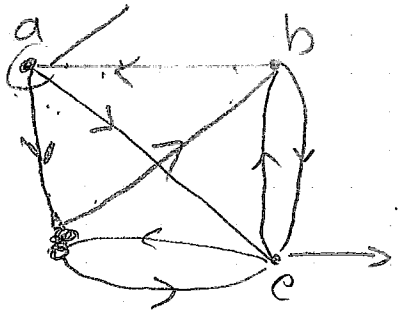
5) 3 8 11 16 21 53 45 26

6) 3, 8, 11, 16, 21, 26, 45, 53

5.4

3 edges = odd

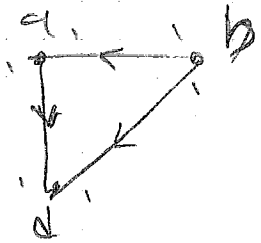
i)



0/

5 edges which is odd

ii)



all the edges are even

0/

iii) the first one

Matrix 1 =

	a	b	c	d
a	0	1	0	0
b	0	1	1	0
c	0	1	1	1
d	1	0	0	0

✓

Matrix 2 =

	a	b	c	d
a	1	1	2	1
b	1	0	0	2
c	1	0	1	1
d	0	2	1	0

✓

8/

6.1

x_i	y_i	x_i^2	y_i^2	$x_i y_i$
1.47	52.21	2.16	2725.88	76.74
1.50	53.12	2.25	2821.73	79.68
1.52	54.48	2.31	2968.07	82.80
1.55	55.84	2.40	3118.10	86.55
1.57	57.20	2.46	3271.84	89.80
1.60	58.57	2.56	3430.44	93.712
1.63	59.93	2.65	3591.60	97.68
1.65	61.29	2.72	3756.46	101.12
1.68	63.11	2.82	3982.87	106.02
1.70	64.47	2.89	4156.380	109.599
1.73	66.28	2.99	4393.03	114.66
1.75	68.09	3.062	4637.61	119.175
1.78	70.14	3.16	4888.80	124.95
1.80	74.46	3.24	5211.39	129.94
1.83		3.34	5544.29	136.21
$\bar{x}=1.650$	$\bar{y}=63.99$	$\Sigma 40.01$	$\Sigma 57598.39$	$\Sigma 1627.26$

$n=15$

1 1

$$r=\frac{\Sigma x y}{\sqrt{\Sigma x^2 \cdot \Sigma y^2}}=\frac{1627.26}{\sqrt{40.01 \times 57598.39}}$$

$\Sigma xy=1627.26$

$r \approx 1.071$ 1

$r=0.99$

$\Sigma x^2=$

3

6.1

$$\beta = r \times \frac{s_y}{s_x} \checkmark \qquad s_y = \sqrt{\frac{(y-\bar{y})^2}{n-1}}$$

$$s_y = \sqrt{\frac{(52.21-63.99)^2+(53.12-63.99)^2+(5..}{14}}$$

$$s_y = \sqrt{\frac{813.711}{14}} = 2.137 = 7.037$$

$$\bar{x} = 1.650$$

$$s_x = \sqrt{\frac{26732.40}{14}} = 43.69 = 0.1142$$

$$\beta = 1.071 \times \frac{2.137}{43.69}$$

$$\beta \simeq 0.052 = 61.54825$$

$$y = 63.9 + 0.052x$$

$$\alpha = \bar{y} - \beta\bar{x}$$

$$= 63.99 - 0.052 \times 1.650$$

$$63.99 \quad 0.085$$

$$= 63.905 = -39.517765$$

1

ditoz 768

6.2 4

2.85
9.7
12.55

$$P(A|B) = \frac{95 \times 3}{95 \times 3 + 97 \times 10}$$

$$= \frac{2.85}{2.85 + 9.7} = 0.227$$

6.3

i) 1. We assume a paired samples 1/1

2. We assume our samples are independet since we have two different groups tested twis and not related to ecch others (XM, XF, male famle.

3. We assume that we have diffrent sample size //

4. we assume that we dont have larg sample size because n < 30

5. Normally distrubuted. 1

6. We assume that we have unequal Varinces. $S_M \neq S_F$ //

ii) it's two tailed test ✓ 1

iii) $H_0 = \mu_M = \mu_F$

$H_0 \neq \mu_M = \mu_F$ ✓ 1

next page

4/

6.3

iv) $t = \dfrac{\bar{x}_1 - \bar{x}_2}{s_\Delta}$ $\quad n = 18$

$$s_\Delta = \sqrt{\frac{12^2}{18} + \frac{12^2}{18}}$$

$s_\Delta = 4$

$$t = \frac{102.4 - 98.9}{4} = \frac{3.5}{4}$$

$t = 0.875$ ✓1

v) $d.f = 18 - 1 = 17$

$\alpha = 0.05$ $\quad T =$

$T_c = 2.110 \neq$ $\quad T_c = 2.030$

$T_c > T_s$ We accepte the H_0

$H_0 = \mu_1 - \mu_2$

vi) $H_0 = \mu_1 = \mu_2$

We accepte the H_0 //

vii) the scuplo is quit equal to each other //

1