

Försättsblad till skriftlig tentamen vid Linköpings universitet



Datum för tentamen	2016-08-17
Sal (1)	<u>TER4</u>
Tid	8-12
Kurskod	TDDI11
Provkod	TEN2
Kursnamn/benämning Provnamn/benämning	Programmering av inbyggda system Skriftlig tentamen
Institution	IDA
Antal uppgifter som ingår i tentamen	7
Jour/Kursansvarig Ange vem som besöker salen	Mikael Asplund
Telefon under skrivtiden	013-282668, 0700-895 827
Besöker salen ca klockan	Ca 9.30
Kursadministratör/kontaktperson (namn + tfnr + mailaddress)	Elin Bröjde, elin.brodje@liu.se
Tillåtna hjälpmedel	Dictionary
Övrigt	
Antal exemplar i påsen	

EXAM

(Tentamen)

TDDI11

Embedded Software

2016-08-17 08:00-12:00

On-call (jour):

Mikael Asplund, 013-282668

Admitted material:

- Dictionary from English to your native language

General instructions:

- The assignments are **not ordered** according to difficulty.
- You may answer in either English or Swedish.
- Read all assignments carefully and completely before you begin.
- Use a new sheet for each assignment and use only one side.
- Before you hand in, order the sheets according to assignment, number each sheet, and fill in AID-number, date, course code and exam code at the top of the page.
- Write clearly. Unreadable text will be ignored.
- Be precise in your statements.
- **Motivate** clearly all statements and reasoning.
- **Explain** calculations and solution procedures.
- If in doubt about the question, write down your interpretation and assumptions.
- Grading: U, 3, 4, 5. The preliminary grading thresholds for p points are:

$0 \leq p < 20$:	U
$20 \leq p < 27$:	3
$27 \leq p < 34$:	4
$34 \leq p \leq 40$:	5

Good Luck!

1d)

What will be the output from the following C program?

```
#include <stdio.h>
int main() {
    printf("%d \n", 5 || 0);
}
```

1. 0
2. 1
3. 5

1e)

What will be the output from the following C program?

```
#include <stdio.h>
int main() {
    printf("%d \n", (1 | 4)^13);
}
```

1. 8
2. 5
3. 13

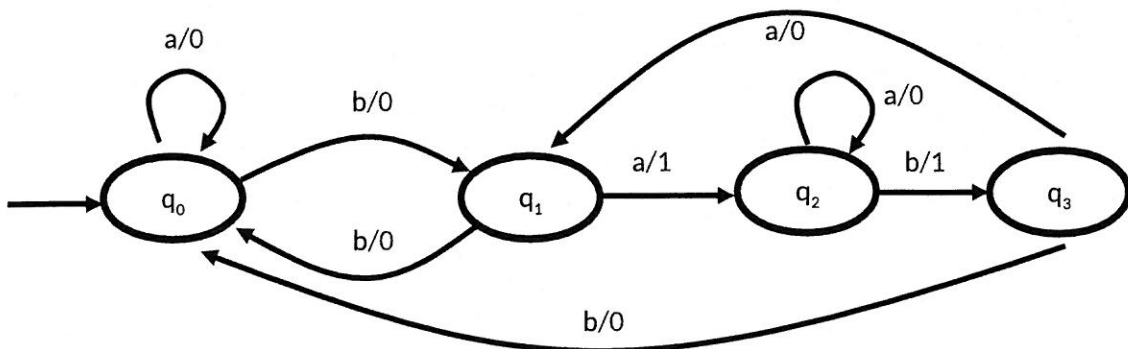
1f)

Which of the following statements is not correct?

1. Direct memory access gives the programmer direct access to the memory.
2. Execution time of the interrupt service routine is a concern in real-time systems.
3. An *interrupt vector* is an address to an interrupt service routine.

1g)

Consider the statemachine below:



Which of the following outputs will be produced by the input string aaabbabab?

1. 000110101
2. 000101000
3. 000000011

Question 4. (5 points)

Consider the following task set for small robot system:

Task	Period	Worst-case execution time (WCET)
Control task	50ms	30ms
Planning task	100ms	20ms
Communication task	500ms	60ms

- 4a) What is the utilisation of the task set? (1p)
- 4b) What would the priorities of the tasks be if the RMS policy is used? (1p)
- 4c) Can the tasks be scheduled with RMS without any deadline misses? (3p)

Question 5. (5 points)

Explain the foreground/background system. Draw a figure, if necessary. Mention the advantages and disadvantages of this system. Finally, describe an alternative approach that does not have the same disadvantages.

Question 6. (5 points)

Give one example of an embedded system and describe what you consider to be the five most important design metrics for this system. Remember to motivate your answers.

Answer sheet for question 1. Please hand this paper in together with the answers for the other questions (numbered and with AID number).

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|------------|----------------------------|----------------------------|----------------------------|
| 1a) | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 |
| 1b) | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 |
| 1c) | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 |
| 1d) | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 |
| 1e) | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 |
| 1f) | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 |
| 1g) | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 |
| 1h) | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 |
| 1i) | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 |
| 1j) | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 |

