

Information Technology

Providing the Industrial Perspective on IT

Joint International Programme

Master of Science (M.Sc.)

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Solution of the Entrance Test

!! STOP !!

**Please try to find
your own solution first**

OK, please go ahead ...

Solution 1 Yes.

Solution 2 The final value of the integer variable "max" after the following statements contains the maximum value in the array:

```
int max = A[0]
for i = 1 to N-1
    if (max < A[i]) max = A[i]
```

Solution 3 Variance = 1.19

Solution 4 $\nabla f = (2x, -2y)^T$

Solution 5 Input variable x , output variable y , time t :

- Additivity: $x_1(t) \rightarrow y_1(t)$, $x_1(t) + x_2(t) \rightarrow y_1(t) + y_2(t)$.
- Multiplication with a constant: $C \cdot x_1(t) \rightarrow C \cdot y_1(t)$.
- Time invariance: $x_1(t) \rightarrow y_1(t)$, $x_1(t-T) \rightarrow y_1(t-T)$.
- Convolution: $y(t) = \int_{-\infty}^{\infty} h(\tau) \cdot x(t-\tau) d\tau$: $h(t)$ is the impulse response of a LTI system.

At least 3 items are desired for a "correct" answer!

Solution 6

$$z = \overline{(B + \overline{AB} + \overline{CD})} = \overline{(B + \overline{A} + \overline{B} + \overline{CD})} = \dots$$
$$\dots = \overline{((B + \overline{B}) + \overline{A} + \overline{CD})} = \overline{(1 + \overline{A} + \overline{CD})} = \overline{1} = 0.$$

Solution 7 The final value of the integer variable "sum" after the following statements contains the sum of all the values in the array:

```
int sum = 0
for i = 0 to N-1
    sum = sum + A[i]
```

Solution 8 Right answer: B

Solution 9 Right answer: C

Solution 10 Possible answers: $i(t) = 4.24A \cdot \cos(\omega t + 30^\circ)$; $i(t) = 3A \cdot \cos(\omega t + 30^\circ)$

Solution 11

A FIR-Filter is a special type of a digital filter which reacts with a finite impulse response. An IIR-Filter is a special type of a digital filter with an infinite impulse response.

The z -system function can be expressed as
$$H(z) = \frac{\sum_i b_i \cdot z^{-i}}{\sum_j a_j \cdot z^{-j}} = \frac{D(z)}{N(z)}$$

FIR-Filter: $D(z) \neq 0, N(z) = 1$. IIR-Filter: $D(z) \neq 0, N(z) \neq 1$.

Solution 12 The impulse response is a sinc function.

Solution 13 $x + 1$

Solution 14 500 kHz

Solution 15 A multiple of $\vec{u} = (1, -1)^T$ or $\vec{u} = (1, 1)^T$

Solution 16 Answer: A, C, D

At least 2 items are desired for a "correct" answer!

Solution 17 Answer: "0"

Solution 18 At most 127.3 days or 22.6 hours, respectively.

Solution 19 Probability = 0.3061

Solution 20 Yes.
