

Master of Automotive Software Engineering program

Problems for Preparation of the Admission Test

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The following collection of problems and test questions provides applicants with an opportunity to familiarize themselves with the content and difficulty level of the admission test for the Master of Automotive Software Engineering program at the Deggendorf Institute of Technology. The problems also represent a range of fundamental subjects considered essential prerequisite knowledge for successful participation in the master's program.

Please be advised that we do not provide the solutions for this sample test.

1. Mathematics

1.1. Calculate the integral $\int_{-\infty}^{\infty} e^{-2|x|} dx$

1.2. Let $\alpha > 1$. Calculate the integral $\int_1^{\infty} \frac{1}{-x^\alpha} dx$

1.3. Expansion into partial fractions

Let $x \in \mathfrak{R}$ (real numbers). Determine the real coefficients a, b, c, d such that

$$\frac{9x - 2}{x^2 - x - 6} = \frac{a}{(x - c)} + \frac{b}{(x - d)}$$

2. Mathematical Logic

2.1. Calculate the conjunctive normal form of the following logic expression.

$$(A \wedge B \vee C) \wedge (B \vee \neg C)$$

(\vee stands for "logic or", \neg stands for "logic not", \wedge stands for "logic and")

3. Networks

- 3.1. Give an example of synchronous communication in telecommunication networks.
- 3.2. In a layered communication protocol, the lower layer adds information (e.g. addresses, check sums) to the data provided by the higher layer. Is this statement true or is it the other way round? Give a reason for your answer.

4. C-/C++-Programming

- 4.1. The following recursive function has a return value of type unsigned int and two parameters of the same type.

```
unsigned int f1(unsigned int a, unsigned int b)
{
    if (a == 0)
        return b;
    else if (b == 0)
        return a;
    else return f1(a, b-1) + b;
}
```

- 4.1.1. What is the return value of f1 called with values 3 for parameter a and 6 for parameter b?

- 4.1.2. What mathematical function is calculated by f1?

- 4.2. Write a C-Function that calculates the maximum of the elements of a vector of type int. The vector and the length of the vector shall be passed as arguments to the function. Assume that arguments passed to the function are correct, errors handling is not necessary.

- 4.3. Transfer the for loop in the following code segment into an equivalent while loop.

```
int a[10];
int i;
for (i=20; i>10; i--)
{
    a[i] = i+1;
}
```

- 4.4. The following C++ class shall be instantiated in the main program below. Write a corresponding code sequence.

```
class c
{
    private:
        int a;
    public:
        c(int i)
        {
            a = i;
        }
};

int main()
{

}
```

- 4.5. Inheritance is a relation between classes in object-oriented programming. Explain why a pointer to a subclass may not point to its base class.

5. UML

- 5.1. Give two example of static UML diagrams?

- 5.2. Explain one difference between UML and a programming language.