Surname: ..... Forename: ..... MatrNo.: .....

Exam: Mathematics 2

Hamburg University of Applied Science
Faculty of Engineering & Computer Science, Department of Information and Electrical Engineering
Prof. Dr. Robert Heß, July 7th 2016, duration: 90 Min.
Permitted aids: up to six A4-pages of personal notes (i.e. single sided sheets)

Result: ..... of 100 points Mark: ..... points.

Problem 1 (10 points)

Solve the following integral: $\int x^2 \cos(\frac{1}{2}x^3)\,\mathrm{d}x$

Problem 2 (15 points)

Draw a contour plot of the function $\boldsymbol{f}(x,y) = y^2 - x$ for $x, y \in [-1, 1]$ and $f \in \{-0.5, 0, 0.5, 1\}$

Problem 3 (25 points)

For the differential equation $y''' + 2y'' = 3(y' + x^2 - 1)$ find the general solution $y(x)$.

Problem 4 (10 points)

For $f(t) = e^{\mathrm{j}(\omega t + \varphi)}$ with ω and φ being parameters create the differential equation.

Problem 5 (20 points)

A random variable X has the probability density function $f(x) = \begin{cases} x/2 & \text{for } 0 \le x < 2 \\ 0 & \text{otherwise} \end{cases}$. Evaluate expectation, variance and standard deviation.

Problem 6 (20 points)

As a manufacturer of electronic components you sell $1\,\mathrm{k\Omega}$ resistors with $1\,\%$ accuracy. For a large number of resistors you measure an average resistance of $995\,\Omega$ normal distributed with a standard deviation of $5\,\Omega$. Evaluate the failure rate.