Student – name (Block capitals, please): [Sem zadejte text.]

Theory	Task1	Task2	Task3	AddOns	Result

1. Coulomb's law.

2. Ohm's law – both [integral and differential] notations.

3. Four [main] Maxwell equations.

4. Boundary conditions at the interface between two conductors.

5. Skin depth as a function of frequency and material properties.

6. Boundary conditions for B, H – interface between two magnetics – tangential components.

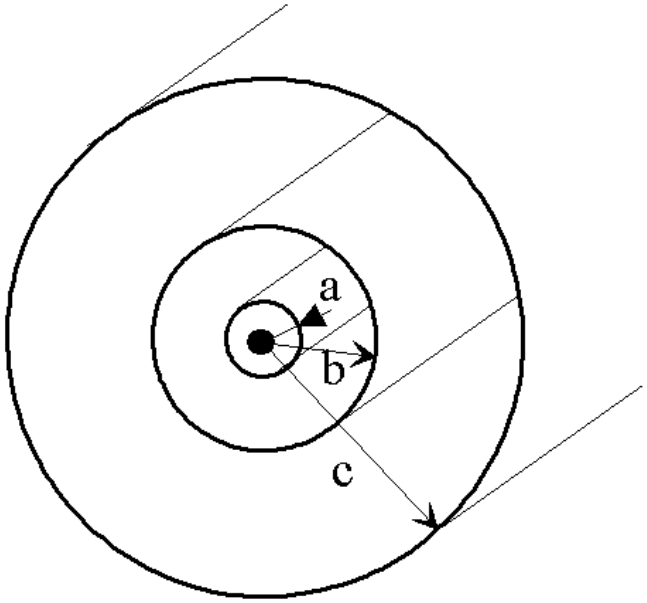
7. Biot-Savart's law.

8. Wave equation for E.

9. Wave impedance as a function of frequency and material properties.

10. Poynting vector – definition.

Student – name (Block capitals, please): [Sem zadejte text.]



TASK 1:

A capacitor of co-axial crossection (see figure on the left) consists of an inner cylindrical conductor, a = 2 mm, thin outer conductor, c = 5 mm and two dielectrics. The interface between dielectrics is @ b = 3 mm. Inner dielectric cylindrical layer relative permitivity ε_{r1} equals 4 while the relative permitivity ε_{r2} of the outer dielectric is equal to 2.
Maximum electric field strengths for the two dielectrics $E_{p1\ and}\ E_{p2}$ are 10 MV/m and 2 MV/m.

Find out:

a) Capacity per meter of this arrangement (5p)
b) Breakdown voltage of the capacitor (5b)

Task 2:

A lossless coaxial transmission line, $\varepsilon_r = 1$, $Z_0 = 50\ \Omega$ is loaded by a series combination of a resistor and a capacitor where R = 50 Ω, C = 68 pF. Based on a frequency f = 300 MHz find out:

a) Magnitude of the reflection (2p)
b) Standing wave ratio (SWR) (4p)
c) Input impedance of the setup for cable length 250 mm. (4p)

Task 3:

A circular (single) loop antenna has a diameter d = 500 mm. A planar electromagnetic wave propagates from the transmitter in the z – direction, while the amplitude of electric field strength is equal to E_y=50mV/m. Free space wavelength is 251 m. Specify:

1. Frequency. . **(1p)**
2. Effective voltage induced into the open loop. **(7p)**
3. Orientation of the antenna providing maximum output voltage. **(2p)**