**ECE 6380**

**Homework 1**

**Friday 9/30/18**

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**Problem #1**

Adjusted Matlab files (HW1\_1.m which calls HW1\_1fem.m) with output plots of |E| are attached.

As the number of cells increases, the magnitude of the E field becomes smoother and converges to 1.

**Problem #2**

The table below was generated using a Matlab script (HW1\_2.m), attached.

|  |  |  |  |
| --- | --- | --- | --- |
| Extrapolated results for reflection and transmission coefficients for a 0.2 λ dielectric slab with εr =4; based on the initial results in Table 5. | | | |
| Reflection coefficient Γ | | | |
| Number of Cells | |Γ| | ∠Γ | Error |
| 4/8 | 0.4094 | 60.6967° | 1.4841% |
| 8/16 | 0.4039 | 60.2833 | 0.1206 |
| 16/32 | 0.4035 | 60.2467 | 0.0215 |
| 32/64 | 0.4034 | 60.2400 | 0.0033 |
|  |  |  |  |
| Exact | 0.4034 | 60.2450 |  |
|  |  |  |  |
| Transmission coefficient τ | | | |
| Number of Cells | | τ | | ∠ τ | Error |
| 4/8 | 0.9125 | 150.6967° | 0.2729% |
| 8/16 | 0.9148 | 150.2833 | 0.0251 |
| 16/32 | 0.9151 | 150.2467 | 0.0077 |
| 32/64 | 0.9150 | 150.2400 | 0.0069 |
|  |  |  |  |
| Exact | 0.9150 | 150.2450 |  |
|  |  |  |  |

**Problem #3**

Modified Matlab code for FEM calculations (HW1\_3femtotal.m) is attached.

Derivation attempted by hand, also attached.