國立成功大學

112學年度碩士班招生考試試題

編　號：186

系　所：電腦與通信工程研究所

科　目：電磁場與波

日　期：0206

節　次：第 2 節

備　註：可使用計算機

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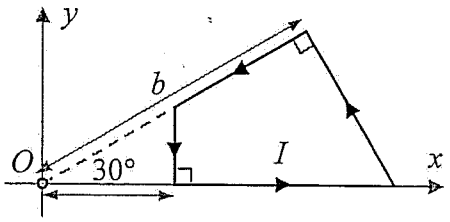
※ 考生請注意：本試題可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

Problem 1: (***20 Points***)

An electric field in free space is given by $\bar{E} = e^{j(\omega t - 24\pi y)} \sin(7\pi z)\,\hat{a}_x \ (V/m)$. (a) What is the frequency? (b) Please find its associated B_z using Maxwell's equations.

Problem 2: (***20 Points***)

Find the magnetic flux density $\bar{B}$ at the point O due to the current loop in free space as shown.



Problem 3: (***20 Points***)

A 5-*m*-long <u>*distortion-less*</u> transmission line has a characteristic impedance $Z_0 = 100\,\Omega$. A signal applied to this line is delayed by 25 *ns* before it is measured at the receiving end and it is attenuated by 1 *Neper*. Determine the *per-unit-length* parameters (*R*, *L*, *C*, and *G*) of this line.

Problem 4: (***20 Points***)

When a uniform plane wave in air is normally incident onto a planar lossless medium, the reflection coefficient is measured to be – 0.5, and the phase velocity of the transmitted wave is reduced by a factor of 4. Find (a) the relative permittivity ε_r and the relative permeability μ_r of this lossless medium. (b) Design a match layer (ε_r, μ_r, and *thickness*) before this medium to reduce the reflection to zero.

Problem 5: (***20 Points***)

The *guided wavelength* of a propagating mode along an air-filled metallic waveguide at 26 GHz is found to be 1.25 cm. Find the cutoff frequency of this mode.