※ 考生請注意：本試題不可使用計算機。　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)

In a source-free vacuum region, the magnetic field intensity $\bar{H}$ is found to be $A_0 \cos(\omega t - 5z)\bar{a}_y \ A/m$. (a) Express $\bar{H}$ in phasor form, (b) find the associated electric field intensity $\bar{E}$ directly from Maxwell's equations, (c) determine ω, and (d) Find the complex *Poynting vector*.

Problem 2: (20 Points)

A distortion-less cable is 6 meter long and has a characteristic impedance of 40 Ω. A signal applied to the cable is delayed by 90 μ sec before is measured at the receiving end and it is attenuated by 1.3 dB. Find *R*, *G*, *L*, and *C* per meter for the cable.

Problem 3: (20 Points)

The wavelength of a propagating mode along an air-filled metallic waveguide at 7.5 GHz is found to be 5 cm. Find (a) the total wave number, (b) the wave number in the propagating direction, (c) the cutoff wave number of this mode, and (d) the cutoff frequency of this mode.

Problem 4: (20 Points)

At the far field, an antenna produces the average power as $\bar{P}_{ave} = \hat{a}_r \frac{2\sin\theta\cos\varphi}{r^2}$ W/m^2 for $0 \le \theta \le \pi$ and $0 \le \varphi \le \pi/2$ in spherical coordinates. Calculate the *beam solid angle*, *directivity*, and *effective aperture* of the antenna.

Problem 5: (20 Points)

A load of 600+*j*300 Ω is connected to a 300 Ω lossless line. **Use a Smith chart to find** (a) Γ, (b) VSWR. Also find (c) the shortest distance from this load and (d) the length of an open stub connected in parallel to yield an impedance match to 300 Ω. The open stub is also a 300 Ω lossless line. Important Note: You MUST use the Smith chart on next page to find all the answers. On your answer sheet, write down and explain every step of your reasoning, sketch the result on simplified Smith charts. **Using any other methods to find the results give you zero points.)**

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Problem 5: (Continued)