

EXAM 2007-03-19, Answers

1. See the solutions of the other exams, or Balanis
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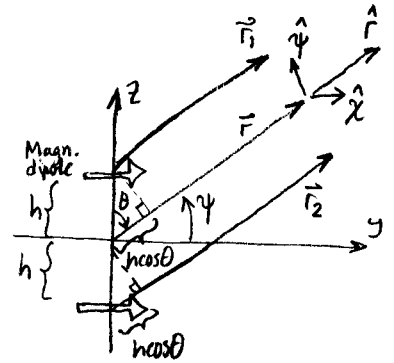
3. a) $AF = -2j[1 - \sin(kd \cos \theta) - \sin(kd \sin \theta \sin \phi)]$

b) $d = \frac{\lambda}{2\sqrt{2}}$

4. a) $E_x = -j \frac{k I_m l}{4\pi r} e^{-jkr} \sqrt{1 - \sin^2 \theta \sin^2 \phi} [2 \cos(\pi \cos \theta)]$

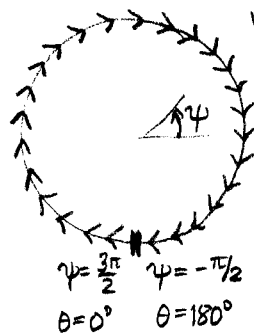
$$H_y = j \frac{k I_m l}{4\pi r} e^{-jkr} \sqrt{1 - \sin^2 \theta \sin^2 \phi} [2 \cos(\pi \cos \theta)]$$

b) $\phi = 30^\circ \Rightarrow$ Nulls for $\theta = 60^\circ, 120^\circ$



5. See Balanis' book or Home Assignment

6. a) visible region ($\hat{=}$ the whole unit circle)



- b) 4 elements are required

c) $a_1 = j$
 $a_2 = -1$
 $a_3 = -j$
 $a_4 = 1$