Fayoum University
Faculty of Engineering

Electromagnetic Waves
EEC305
Electrical Engineering Department
85 points is the maximum.

3 hour
Fall 2015
3rd year Communication students

Question 1 [25 Marks]

Consider the following Electromagnetic wave propagating into unbounded lossless dielectric media.

$$E(y,t) = a_z \cos(6.9 \times 10^9 t - 46.0767y + 0.7854)(\frac{v}{m})$$

a- What is the direction of propagation?
b- What is the plane of polarization?
c- What is the type of polarization of the EM wave?
d- Calculate $\beta, \lambda, u_p and\ \eta$
e- Evaluate $H(y,t)$

Question 2 [20 Marks]

Consider that EM wave is normally incident on plane conducting media. Consider that $\frac{\sigma}{\omega\epsilon} \gg 1$, What is the value of the conductivity of the conducting media in order to get EM power penetrate into the conductor media is decreased by $20\log_{10} e^{-1}$ (db) at 0.15(μm) from the surface. Consider that $\mu_r = 1000$

$$E(y,t) = a_z \cos(6.9 \times 10^9 t - 46.0767y + 0.7854)(\frac{v}{m})$$

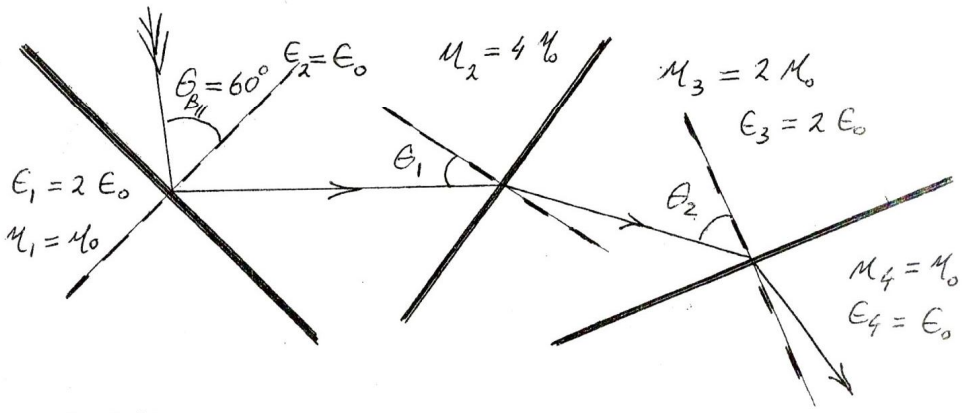
Question 3 [20 Marks]

a- Prove that for **perpendicular polarization** of oblique EMW incidence from media 1 to media 2 at plane dielectric boundary , the Brewster angle is obtained by

$$sin\theta_{B_\perp} = \frac{1}{\sqrt{1+\frac{\mu_1}{\mu_2}}}$$

b- For EMW incident on plane dielectric at $\theta_{B_\parallel} = 60^o$ as shown in figure. It is required that the EMW to pass through the cascaded medias without any reflection. Calculate the slope of each boundary ($\theta_1 and\ \theta_2$) .

EMW= Electro magnetic wave



Amr M. Gody

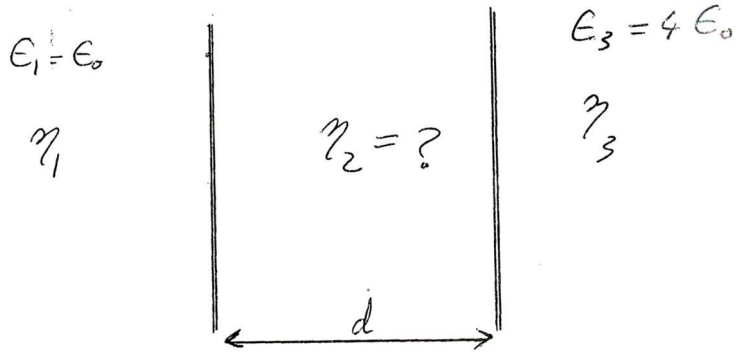
Question 4 [20 Marks]

Consider the following figure, it is required to design the intermediate material in such that to match with the following conditions

1- The operating frequency is 1.6 (GHZ)
2- All materials are nonmagnetic materials.

Calculate

a- $\eta_2 and\ d$
b- The ratio with respect to the incident of the power delivered to material 3 in db.



مع خالص امنياتي بالتوفيق

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