ECEN 5156 – Physical Optics, Spring Semester 2003, University of Colorado at Boulder

Quiz #1

Please answer the following questions and give a brief explanation of your answer.

1. The phase velocity is the velocity of a wavefront so it can only be properly defined for plane waves.  
   T  F

2. A one-dimensional wave packet in a nondispersive medium propagates with a group velocity equal to the phase velocity $c/n$, where $c$ is the speed of light in vacuum and $n$ the index of refraction.  
   T  F

3. The group velocity of a 3D wave-group at a given time $t$ can be defined as the velocity of the surfaces on which the absolute amplitude attains its maximum at time $t$.  
   T  F

4. An electromagnetic wave has the same state of polarization at every point of the field.  
   T  F

5. The state of polarization can be completely determined by giving two parameters (real numbers).  
   T  F

6. Jones matrix, Stokes parameters, and Poincare sphere are all different but equivalent representations of the state of polarization.  
   T  F

7. The Fresnel formulae can be derived from the scalar wave equation.  
   T  F

8. The Fresnel formulae provide the reflection and transmission coefficients of a plane wave incident on a planar interface between two homogeneous media.  
   T  F

9. If we shine a flashlight normal to the surface of water from air we get more reflected light than if we shine the same flashlight normal to the surface but from inside the water.  
   T  F

10. The transmissivity is equal to the square absolute value of the transmission coefficient.  
    T  F

11. Light reflected at the Brewster angle will be linearly polarized with the E-field parallel to the plane of incidence.  
    T  F

12. During total internal reflection the component of the Poynting vector in the direction normal to the boundary is non-zero.  
    T  F

13. During total internal reflection there is no transfer of energy through the planar surface and an evanescent field exists on the other side of the surface (low index side). How did the energy of the evanescent field get there?