Week 10 Lecture 24 Quiz:
The BTE: Transport Coefficients

ECE 656: Electronic Conduction In Semiconductors

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Student's name: _____

Answer the **multiple choice questions** below by choosing the **one, best answer**. Then **ask a question** about the lecture.

1) What is the quantity. $\frac{1}{A}\sum_k \left(E - F_n\right)\vec{\upsilon}\left(\vec{k}\right) f\left(\vec{r},\vec{k}\right)$? ($E$ is the total energy.)
   a) The energy density.
   b) The energy flux.
   c) The heat density.
   d) The heat flux.
   e) The kinetic energy flux.

2) In this equation, $\hat{C}f = -\left(\frac{f\left(\vec{p}\right) - f_S\left(\vec{p}\right)}{\tau_m}\right)$, what is $f_S\left(\vec{p}\right)$?
   a) The distribution function.
   b) The equilibrium distribution function.
   c) A distribution with the shape of the equilibrium distribution function.
   d) The Bose-Einstein distribution.
   e) The anti-symmetric part of the distribution function.

3) How do we interpret the quantity, $\left(\vec{\upsilon}\,\vec{\upsilon}\right)$?
   a) As a scalar.
   b) As a vector.
   c) As a second rank tensor.
   d) As a third rank tensor .
   e) None of the above.

4) For spherical bands, how is the average scattering time, $\left\langle\left\langle \tau_m \right\rangle\right\rangle$ defined?
   a) $\left\langle \upsilon_x^2 \tau_m \right\rangle / \left\langle \upsilon_x^2 \right\rangle$.
   b) . $\left\langle \upsilon^2 \tau_m \right\rangle / \left\langle \upsilon^2 \right\rangle$.
   c) $\left\langle \left(E - E_C\right)\tau_m \right\rangle / \left\langle \left(E - E_C\right) \right\rangle$.
   d) All of the above.
   e) None of the above.

5) What is $\frac{1}{\mu_{tot}} = \frac{1}{\mu_1} + \frac{1}{\mu_2}$ called?

a) The Thompson relation.
b) The Kelvin relation.
c) The Wiedemann-Franz law.
d) The Lorenz number.
e) Mathiessen's rule.

6) What question do you have about this lecture?

Turn in to Prof. Lundstrom in class on Wednesday, Oct. 30 .