

## EE Quals 16, Engineering Physics

### Shan Wang

- a) If you can arrange a set of bar permanent magnets in any manner, could you make the magnetic field confined to one side?

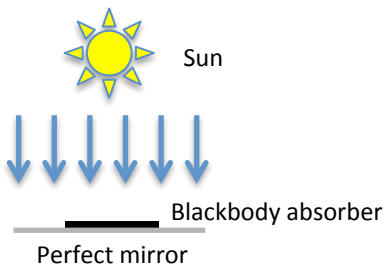
The answer is yes, but how? Most people will be a bit surprised initially by this question for its apparent difficulty or even impossibility. It is meant to be an open ended question to see if one can think of a way to cancel the magnetic field in one side of a plane by arranging magnets along a straight line. Hints are given verbally. The answer only needs to be correct qualitatively.

- b) Do you know how refrigerator magnets work?

This part is only for people completely lost in a). A few points are given if one describes refrigerator magnets correctly.

**EE Ph. D. Qualifying Exam. Jan. 25-29, 2016. Shanhui Fan. Engineering Physics**

- (a) Suppose the sun can be approximated as having a temperature of 6000K. Sketch the emission spectrum of the sun.
- (b) Consider the following solar heating experiment, where the direct sunlight is normally incident upon a piece of blackbody backed by mirror. The blackbody is placed somewhere near earth. What is the maximum temperature that the blackbody can reach?



- (c) Consider instead the experiment where one places a lens in front of the blackbody absorber to focus the sun light onto the blackbody. Could you sketch how would you predict the temperature of the blackbody?
- (d) If one can use a lens that can have arbitrarily large aperture, what is the maximum temperature that the blackbody can reach?

