NENG 685 Fall 2017
PF 7 Due Nov. 17, 2017 (@ 1200)

Name:

On Pre-flights:

- If you work with anyone else, document what you worked on together.
- If you are not using python, then substitute your language of choice when Python is specified.

Do not write in the table to the right.

Problem	Points	Score
1	14	
2	12	
3	9	
4	3	
5	8	
6	9	
Total:	55	

1. (a) (3 points) What are the three main blocks in an MCNP input deck?

Cell Cards
Surface Cards
Data Cards

(b) (1 point) How are each of the three main blocks in the input deck separated?

A blank line is used as the delimiter and eventually the terminator

(c) (2 points) How many columns of input can you specify in a MCNP input deck?

80 Columns

(d) (2 points) What are the two methods of commenting a MCNP input deck?

Placing a C (not case sensitive) at the start of a line followed by a space, comments the whole line.

Useing a $ everything after is a comment

(e) (2 points) Describe the role of the ':' union operator.

This is used as an OR operator between two regions

(f) (2 points) Describe the role of the '#' complement operator.

This is used as the NOT operator for a region

(g) (2 points) Describe the role of the intersection operator.

This is used as the AND operator for regions

2. (a) (6 points) Create the surfaces (without using macrobodies) to build a box that is 5 cm on a side centered on the origin.

```
1 PX 2.5
11 PX -2.5
2 PY 2.5
22 PY -2.5
3 PZ 2.5
33 PZ -2.5
```

(b) (3 points) Create the same surface using a macrobody.

```
555 BOX -2.5 -2.5 -2.5 5 0 0 5 0 0 5 0 0
```

(c) (3 points) Create a cell filled with water (material #1) that resides entirely inside the box specified in either part a) or b). In this cell, we want to transport neutrons and not photons.

```
M1 1001.60c -0.11190 $ H-1 and mass fraction
   8016.60c -0.88810 $ O-16 and mass fraction
```

3. (a) (2 points) Create the a material card for HEU (93.15 wt% ^{235}U, 6.85 wt% ^{238}U) for neutron transport.

```
M2 92238 -0.9315 92238 -0.0685
```

(b) (4 points) Create surfaces to define a 10 cm tall half-cylinder (i.e. the cross-sectional area looks like a "D") of radius 1 inch parallel to the z-axis with the base centered on the origin. The half-cylinder is defined in the positive x direction

(i.e. all the "—" of the "D" is the y axis).

(c) (3 points) Create a cell for photon and neutron transport made of HEU contained within the surfaces defined in part b).

4. (3 points) Create the isotropic source of 14.1 MeV neutrons located at the coordinates (0, 3, 10).

5. (a) (1 point) What tally is used to get the surface current in units of particles?

(b) (1 point) What tally is used to get the surface energy flux in units of MeV/cm^2?

(c) (1 point) What tally is used to get the volume flux in a cell in units of particles/cm^2?

(d) (1 point) What tally is used to get the detector pulse height distribution in a (detector) cell?

(e) (4 points) What is the card that would be used to specify the energy structure for the volume flux tally F14? The energy bin structure is 0-100 keV, 100 keV - 1 MeV, 1 -14.1 MeV.

6. (a) (2 points) How has the course structure worked for you so far?

Been alright.

(b) (2 points) How can we improve the PENTRAN content? Early returns - how likely are you to use PENTRAN in the future?

More examples, or even better solutions to go with it so if someone gets behind or does a typo they can easily catch up.

(c) (2 points) Again, maybe a bit early, but what do you think of bringing in the outside experts to cover SCALE and PENTRAN? Do you think the benefits outweigh the drawbacks?

While it has so far been a valuable experiance in showing what exists; the amount of time it has taken up for something that currently seems to be unlikely to be used in future quarters I am not entirely sure it was good use of time since these begining courses are the foundations/reviews (which I really need).

Scale was really nice to learn about though.

(d) (3 points) Do you feel that I adequately addressed the first round of feedback? If not, how can I improve?

Yup