All mass flows are "per 18 months".

U in SF is 0.88 w/o fissile (w/o = weight percent). Pu in SF is 62.9 w/o fissile. Capture-to-fission ratio for U-235 = 0.169. Enrichment tails assay = 0.22 w/o. Natural U assay = 0.71 w/o

At steady state, each 18 months, one third (1/3) of the core is replaced by fresh fuel, and each load of fuel spends 54 months in the reactor. Ignore all losses; neglect conversion and storage costs. Assume steady state all the time.

Cost Data (for the year of startup)
Natural U = 90 $/kg U
Enrichment = 100 $/kg SWU
Fabrication = 260 $/kg U
Interest rate = 5 % per year

1. (40 pts) Using the DATA, calculate the following:
   a) The specific burnup (in MWd/ton).
   b) Contribution of Pu to energy production (in %).
   c) Amount of natural U needed to produce 1 kg U in fuel load.
   d) Amount of SWU required to produce 1 kg U in fuel load.
   e) Total cost invested in 1 kg U in fuel load (fabrication cost included).
   f) The cost calculated in part (e) is in CONSTANT S's for the year of startup because the unit cost data are given for that year. Calculate the cost in part (e) in SPENT S's. Times of payments are: for natural U purchase, 5 years before startup; for enrichment, 4 years before startup; for fabrication, 2 years before startup.

2. (24 pts) Assume a closed cycle in which U and Pu in SF are recovered as pure and separate streams. Recovered U is enriched to 4.8 w/o before being recycled. Recovered Pu is blended with depleted U (0.22 w/o U-235) in order to produce MOX with a total fissile content of 6.0 w/o.
   Using the same DATA, calculate:
   a) Amount of recycle U (4.8 w/o) obtained from 1 kg of SF.
   b) Amount of MOX (as heavy metal, 6.0 w/o) produced from 1 kg of SF.