

First Hour Exam
NEEP-423
Oct. 6, 1997

Points

Question

- 15 1.) **Give the first and second most used materials in today's fission power plants for the following components;**
 a.) Fuel
 b.) Cladding
 c.) Control Rods
 d.) Pressure Vessel Structural Material
- 15 2.) **a.) What is the single largest drawback of metallic U fuel for power reactors?
 b.) Give 3 other reasons why reactor vendors switched from metallic U to oxide fuels for light water reactors.**
- 15 3.) **What were the 3 events in the 1980's that caused the public to reassess fission power? How did the IFR propose to address those problems?**
- 15 4.) **a.) What is the difference between Zircalloy-2 and Zircalloy-4? In what kind of reactors do we use these alloys?
 b.) Why don't we use Zircalloy in Fast Breeder Reactors?**
- 20 5.) **Country X is suspected of making weapons grade ^{235}U (i. e., $>90\%$ ^{235}U) You are part of an IAEA observation team and your intelligence network tells you that 20 canisters of UF_6 (each container has 100 kg of natural UF_6) were seen going into the plant. Furthermore the plant has a 2 MW_e electrical line going into it which is used 24 hr's a day. Exactly 1 year later you see them removing the tails which now contain 0.2% ^{235}U . Could they have made enough weapons grade ^{235}U (10 kg) for a bomb?**
- Note : They used a gaseous diffusion process which requires 3 MWh/SWU**
- 20 6.) **a.) In the early 1970's, what was the major cause of fuel element failure in BWR's? In PWR's ? Explain, qualitatively, each mechanism.
 b.) What is the major cause of fuel element failure in PWR's today? Explain.**