Y 5094

M.E. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2006.

Elective

Energy Engineering

EY 037 — NUCLEAR ENGINEERING

(Regulation 2002)

me : Three hours — Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Represent the fission reaction. Write down the approximate distribution of energy per fission.

2. What is breeding?

3. Write down the isotopes of uranium with their composition.

4. Why is hafnium separation necessary from zirconium during its extraction?

5. Define 'distribution coefficient' and 'separation factor'.

6. What are the differences in spent fuel and solid wastes characteristics?

7. What are the principles of ion exchange?

8. What is the principle of photo ionization method?

9. Define 'effective half-life'.

10. Define 'rad'.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Discuss (1) scattering reactions (2) elastic scattering and (3) inelastic scattering. (2 + 3 + 3)

(ii) Explain the mechanism of fission process. (8)

Or

(b) (i) Explain the general features of nuclear reactors using a neat sketch. (8)

(ii) Discuss the design and constructional features of pressurized water reactors. (8)

12. (a) (i) Write down a flow sheet and explain the production of UO_2 from yellow cake. (8)

(ii) Using a flow sheet explain the production of zirconium from its ores. (8)

Or

(b) (i) Explain the production of thorium cake from its ore with the help of a flow sheet. (8)

(ii) Discuss the production of beryllium from its ore with the help of a flow sheet. (8)

13. (a) (i) With the help of a flow sheet explain the complete uranium fuel cycle. (8)

(ii) Discuss the principle of solvent extraction and its application in spent fuel processing. (8)

Or

(b) (i) Use a flow diagram to explain the spent fuel reprocessing. (10)

(ii) Discuss the functioning of a mixer settler unit with the help of a sketch for solvent extraction. (6)

14. (a) (i) Discuss the Purex process for the treatment of spent fuel. (8)

(ii) With the help of reactions explain the role ion exchange technique in the separation of reactor products. (8)

Or

(b) Explain the (i) gas-centrifuge and (ii) gaseous - diffusion methods for the separation of uranium isotopes. (16)

15. (a) (i) What are the characteristics of radio active wastes? Explain. (8)

(ii) Discuss the methods adopted for the isolation of high-level wastes. (8)

Or

(b) (i) Describe the effects of different types of radiation. (8)

(ii) Discuss the methods adopted for radiation hazard prevention. (8)

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