Reg. No. : | | | | | | | | | | |

S 4935

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2007.

Seventh Semester

Mechanical Engineering

ME 1010 — NUCLEAR ENGINEERING

(Common to B.E. (Part–Time) Sixth Semester Regulation 2005)

(Regulation 2004)

Time : Three hours Maximum : 100 marks

Approved Thermodynamic tables and charts permitted.

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. What is amu? What is its importance in nuclear physics?

2. What do you understand by the terms 'binding energy' and 'mass defect'?

3. Distinguish between fission and fusion.

4. What is meant by natural radioactivity?

5. Define 'Reprocessing' as applied to nuclear fuel.

6. What is reproduction factor?

7. What are the different types of fast breeding reactors?

8. What is meant by 'breeding'? What factors control breeding?

9. How do you classify different types of wastes coming out at different stages of nuclear fuel cycle.

10. List out the effects of nuclear radiations.

PART B — ($5 \times 16 = 80$ marks)

11. (a) State the law of mass energy equivalence and calculate the energy in kW likely to be produced by one gram of matter taking light velocity as 3×10^8 m/sec.

Or

(b) (i) Define 'half life', 'mean life' and 'decay constant'. (6)

(ii) Write a brief note on 'neutron interactions' and 'cross sections'. (10)

12. (a) What is a chain reaction? How it is maintained? What is the difference between controlled and uncontrolled chain reaction?

Or

(b) Write short notes on :

(i) nuclear fuel cycles and its characteristics (8)

(ii) uranium production and purification. (8)

13. (a) Explain clearly (i) nuclear fuel cycle with a sketch and (ii) spent fuel characteristics.

Or

(b) Draw and explain a solvent extraction equipment.

14. (a) Explain the design and construction of fast breeding reactors.

Or

(b) (i) Discuss about 'reactor shielding'. (8)

(ii) What are fusion reactors? Discuss. (8)

15. (a) (i) Explain the criteria for safety in nuclear power plants. (8)

(ii) What are the safety systems adopted in modern nuclear reactors. (8)

Or

(b) (i) Explain any one of the radioactive waste disposal system. (8)

(ii) Write brief notes on 'radiation hazards and their prevention'. (8)

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