CODE NO: 07A81802

R07

SET No - 1

IV B.TECH - II SEMESTER EXAMINATIONS, APRIL/MAY, 2011
NUCLEAR METALLURGY
(METALLURGY AND MATERIAL TECHNLOGY)

Time: 3hours **Max. Marks: 80**

Answer any FIVE questions
All Questions Carry Equal Marks
- - -

1.a) What is packing fraction of a nucleus? Explain its significance.
b) What is mass defect? Calculate the mass defect and the binding energy of a deuteron. [8+8]

2. Write short notes on the following:
a) Radiation damage
b) Protection against radiations. [16]

3. What is a nuclear reactor? Discuss critically on classification of reactors and their in functioning. [16]

4.a) Explain the production of zirconium tubes from its raw material.
b) How nuclear grade Beryllium is produced? Explain with flow diagram. [8+8]

5.a) Write a brief note on radioactive waste disposal.
b) Explain different types of nuclear interactions. [8+8]

6. Write short notes on the following:
a) Kroll's process of Zirconium
b) Nuclear power development in India. [16]

7. What are the fuels and coolants used in fast breeder reactor? Explain the advantages of LMFBR over other types of FBRs. [16]

8. Discuss the important properties that a coolant must possess, with respect to different types of reactors? [16]

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CODE NO: 07A81802 | R07 | SET No - 2

IV B.TECH - II SEMESTER EXAMINATIONS, APRIL/MAY, 2011
NUCLEAR METALLURGY
(METALLURGY AND MATERIAL TECHNLOGY)

Time: 3hours **Max. Marks: 80**

Answer any FIVE questions
All Questions Carry Equal Marks
- - -

1.a) Assuming that protons and neutrons possess equal masses, calculate how many times nuclear matter is denser than water if nuclear radius is given by $1.2\times10^{-15} A^{1/3}m$, where A is the mass number?

b) Calculate the binding energy when
i) One neutron and one proton combine to form a deuteron.
ii) Two neutrons and two protons combine to form an α-particle.
Given, mass of neutron = 1.00893 amu, mass of proton = 1.00813 amu.
Mass of deuteron = 2.01473 amu and mass of α-particle = 4.00389 amu. [16]

2. Write short notes on the following:
a) Mechanism of moderation in nuclear reactors.
b) Radiation damage and radiation growth. [16]

3. What is the basis for classification of nuclear reactors? Explain them critically. [16]

4.a) Explain about Nuclear Power Production in India and its economies.
b) What is spent fuel? Explain various methods of its processing. [16]

5. Discuss the following:
a) Canning materials
b) Shielding materials
c) Radiation detection. [16]

6. Give the reasons for the following:
a) Liquid metals are used as coolants in Fast Breeder Reactors.
b) Nuclear grade uranium should be Hafnium free.
c) UO_2 is more advantageous than metallic uranium as nuclear fuel in the reactor.
d) Sodium or Magnesium is used as reducing agent in uranium reduction.
e) Alkali leaching is more beneficial than acid leaching in recovery of uranium from its ore. [16]

7.a) Distinguish between thermal reactors and breeder reactors.
b) What are the applications of nuclear reactors? [16]

8.a) How the effective multiplication factor is controlled In a nuclear reactor? Explain the essential requirements of controlling elements.
b) What is chain reaction? Explain its importance. [16]

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R07

SET No - 3

IV B.TECH - II SEMESTER EXAMINATIONS, APRIL/MAY, 2011
NUCLEAR METALLURGY
(METALLURGY AND MATERIAL TECHNLOGY)

Time: 3hours **Max. Marks: 80**

Answer any FIVE questions
All Questions Carry Equal Marks
- - -

1.a) The mass of $_{17}Cl^{35}$ is 34.9800 amu. Calculate its binding energy. What is the binding energy per nucleon? Mass of neutron = 1.008665 amu and proton = 1.007825 amu.
b) What is Liquid Drop Model? Explain different nuclear phenomenon with the help of this model. [8+8]

2. Write short notes on the following:
a) Thermal Cycling
b) Enrichment of uranium. [8+8]

3. How nuclear reactors are classified based on their purpose? Discuss on each of them. [16]

4.a) What is spent fuel? How is the plutonium recovered from it?
b) Write a short note on radioactive radiation hazards. [8+8]

5. Classify and discuss the effects of radiation on fissile, non-fissile and structural materials used in a reactor.

6. Draw a neat sketch of gas cooled fast breeder reactor and its general characteristics. [16]

7.a) Explain the advantages of fast breeder reactors.
b) How hafnium free uranium is produced? [8+8]

8. What are the important characteristics of moderators and reflectors used in the nuclear reactors? Discuss about different materials used as moderators. [16]

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CODE NO: 07A81802

R07

SET No - 4

IV B.TECH - II SEMESTER EXAMINATIONS, APRIL/MAY, 2011
NUCLEAR METALLURGY
(METALLURGY AND MATERIAL TECHNLOGY)

Time: 3hours **Max. Marks: 80**

Answer any FIVE questions
All Questions Carry Equal Marks
- - -

1.a) What is radio activity? Explain general properties of radio-active radiations.
b) What is half-life period? Derive an equation for half-life period from the fundamentals. [8+8]

2.a) What is heavy water? How is it suitable as moderator in nuclear reactors?
b) The radio of mass Pb^{206} to the mass of U^{238} in a certain rock specimen is found to be 0.5. Estimate its age assuming that the rock originally contains no lead. Half-life of uranium is 4.5×10^9 years. [8+8]

3. What is the function of a moderator in nuclear reactor? What materials can be used as moderators? Explain the important characteristics of the moderators used in different moderators. [16]

4. Critically discuss the effects of radiation on fissile, non-fissile and structural materials used in a reactor. [16]

5. Explain the process of irradiated fuel for recovery of plutonium. [16]

6.a) 'Disposal of radioactive wastes is very important activity in the field of nuclear reactors'. Explain how and why it is important.
b) What are the applications of nuclear reactors? [8+8]

7.a) Write a brief note on nuclear power production in India.
b) Why UO_2 is used rather than metallic uranium? Explain. [8+8]

8.a) Explain the advantages of fast breeder reactors.
b) How enrichment of uranium oxide is done? [8+8]

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