Code No: **R42087** **R10** **Set No. 1**

IV B.Tech II Semester Regular/Supplementary Examinations, April - 2015

NUCLEAR REACTOR ENGINEERING

(Chemical Engineering)

Time: 3 hours **Max. Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1 Explain the general features of a nuclear fission reactor with the help of a schematic representation of a nuclear system. [15]

2 Explain the ways in which gamma rays interact with an absorbing material. [15]

3 Explain neutron moderation in presence of absorbing and non absorbing infinite media. [15]

4 Discuss the significance of 'burn up' calculations in reactors. Explain how these calculations are carried out. [15]

5 a) Explain various aspects of xenon poisoning during reactor operations. [10]

b) Discuss the significance of temperature coefficient of reactivity. [5]

6 a) Discuss the radiation exposure pathways. [8]

b) Explain briefly the principle reasons for reactor shielding. [7]

7 Write short notes on the following:

a) Stress intensity [5]
b) Factors affecting thermal stresses [5]
c) Radiation effects in materials [5]

8 Explain the environmental effects of nuclear power with the help of a case study. [15]

Code No: **R42087** **R10** **Set No. 2**

IV B.Tech II Semester Regular/Supplementary Examinations, April - 2015

NUCLEAR REACTOR ENGINEERING

(Chemical Engineering)

Time: 3 hours **Max. Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks
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1 Explain the classification of fission reactions giving their features. [15]

2 a) What is macroscopic cross section and how is it determined. [8]

b) Explain the phenomena of variation of absorption cross sections with neutron energy. [7]

3 a) Discuss how logarithmic energy decrement per collision is useful to quantify slowing down of neutrons. [8]

b) Derive steady state diffusion equation. Explain the terms diffusion coefficient and diffusion length. [7]

4 a) Write the steady state neutron transport equation and explain all the terms in it clearly. [8]

b) Explain the purpose of fuel depletion calculations in a reactor. Illustrate the result of such calculations for the case of a pressurized-water reactor. [7]

5 Discuss various aspects of reactor stability analysis. [15]

6 a) What are the principles of shielding in nuclear reactors? Classify shields with an example for each. [8]

b) Write a detailed note on various radiations produced from reactor systems during fission process. [7]

7 Write short notes on the following:
a) Temperature dependent swelling [5]
b) Mechanisms of radiation damage [5]
c) Moderator and reflector materials [5]

8 Explain in detail the following:
a) Nuclear waste management [8]
b) Nuclear reactor safety [7]

Code No: **R42087** **R10** **Set No. 3**

IV B.Tech II Semester Regular/Supplementary Examinations, April - 2015

NUCLEAR REACTOR ENGINEERING

(Chemical Engineering)

Time: 3 hours **Max. Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

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1 a) Explain binding energy. [7]

b) Mention various radioactive reactions that are of importance in the operation of nuclear reactors. [8]

2 Explain the concept of cross sections. Discuss the transformation method for cross section determination. [15]

3 Explain why neutrons are slowed down in fission reaction. Discuss various aspects of neutron moderation. [15]

4 Discuss the neutron transport equation and the approximations to solve it. [15]

5 Explain the significance of various temperature coefficients in thermal and fast reactors. [15]

6 Write in detail the biological effects of radiation. [15]

7 Write short notes on:
a) Structural and cladding materials [8]
b) Moderator and reflector materials. [7]

8 Explain the safety regulations and nuclear reactor protection system. [15]

Code No: **R42087** **R10** **Set No. 4**

IV B.Tech II Semester Regular/Supplementary Examinations, April - 2015

NUCLEAR REACTOR ENGINEERING

(Chemical Engineering)

Time: 3 hours **Max. Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks
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1	a)	What is radioactivity? Explain the cause of radioactivity in some elements.	[8]
	b)	Explain the stages concerned with a nuclear fuel.	[7]
2		Discuss in detail the mechanism of nuclear fission.	[15]
3	a)	Explain the Fermi model for slowing down of neutrons.	[8]
	b)	Explain the age-diffusion critical equations.	[7]
4		Discuss multi group diffusion theory and derive group diffusion equation.	[15]
5	a)	Explain the effect of poisons on reactivity.	[7]
	b)	Derive the fundamental equations of reactor kinetics from one–group theory	[8]
6	a)	What are radiation protection standards applied around nuclear reactors?	[8]
	b)	Explain the principles of shield design.	[7]
7		Explain various mechanical properties of non-fuel materials that are considered to be important in reactor design.	[15]
8		Discuss various aspects of nuclear waste management.	[15]