

Master of Nuclear Engineering 1st Year 2nd Semester Examination - 2024

Reactor Physics & Engineering II

Time: 3 hrs

Full marks: 100

(Use separate answer scripts for each part)

Part I

Answer Any Six Questions

1. Explain the fundamental operational principle of heat generation and removal leading to power generation in a nuclear power plant. Use suitable diagrams as necessary. (10)
2. Discuss the safety principles followed in the operation of a nuclear reactor. How is it ensured that radioactivity present within an operating reactor does not reach the environment? (6+4)
3. (a) What do you understand by the following terms in the context of a nuclear reactor? Explain with examples.
 - i. Design-basis accident
 - ii. Beyond-design-basis accident
 - iii. Severe accident (10)
4. Compare the progression of a *Loss of Coolant Accident* in a PWR and BWR. What measures are undertaken to mitigate such accidents? (10)
5. Differentiate between *Active* and *Passive* safety systems. How are passive safety systems utilised for ensuring safety of nuclear reactors? (5+5)
6. What is the difference between *Fault Tree Analysis* and *Event Tree Analysis*? Explain through examples. (5+5)
7. What do you understand by *Large Early Release Frequency*? Briefly discuss how radioactive products are dispersed on atmospheric discharge from a power plant. (5+5)

[Turn over

Ref No.:- Ex/PG/NuE/T/127A/2024

Master of Nuclear Engineering 2nd Semester Examination, 2024

Subject: Reactor Physics and Engineering II

PART II

(40 Marks)

Answer all questions

(Use separate answer sheets)

1. Short Questions

(4 × 2)

- a) How to increase ^{235}U isotopes in uranium powder?
- b) Discuss the major sources of the radioactive waste.
- c) What are the advantages of fusion-powered energy?
- d) What is the indirect drive concept for Inertial Confinement Fusion?

2. Broad Questions

(4 × 8)

- a) Briefly describe the reprocessing and recycling of spent fuel. What are the major sources of thorium in India? Discuss the use of thorium as fuel in a nuclear reactor.
or 3+2+3
- b) Discuss the storage and disposal facilities for radioactive wastes of types A, B, and C. 8
- c) What is Debye shielding? Briefly discuss about Lawson and Ignition criterion for nuclear fusion. 2+6
- d) What are the differences between inertial confinement fusion and magnetic confinement fusion? Describe the working principle of a Tokamak reactor. 3+5
- e) Why lithium blanket is used as inner wall shield in a tokamak? What is divertor? Why it is used in a Tokamak? 3+2+3
or
- f) Describe toroidal and poloidal magnetic field systems and central solenoid in tokamak reactor. 8