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Reg No.:_____   Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017
Course Code: ME371
Course Name: NUCLEAR ENGINEERING (ME)

Max. Marks: 100   Duration: 3 Hours

PART A
Answer any three full questions, each carries 10 marks.

Marks

1 a) Illustrate the liquid drop model of nuclear fission   (4)

   b) Explain the concept of chain reaction with a suitable example.   (6)

2 a) Define the radioactive decay law.   (3)

   b) Identify the radioactive reactions following, when a neutron is captured by a U_{238} (3)
       substance.

   c) Compare nuclear fission and nuclear fusion.   (4)

3 a) Explain the significance of infinite multiplication factor.   (5)

   b) Illustrate and explain the slowing down of neutrons.   (5)

4 a) Explain critical size of a reactor   (2)

   b) Identify and explain the working of a reactor system in which nuclear fission is   (4)
       the working principle.

   c) Explain the basic features of nuclear reactor control.   (4)

PART B
Answer any three full questions, each carries 10 marks.

5 a) Identify the primary control features in a Boiling Water Reactor.   (3)

   b) Explain the structural features of nuclear fuel rods and its significance.   (3)

   c) Illustrate the working of a boiling water reactor with neat sketch.   (4)

6 a) Name the fuels being used in a Boiling Water Reactor.   (3)

   b) Infer the various coolants that can be employed in a reactor system and state the   (3)
       reasons for the same.

   c) Distinguish the various materials for reactor construction in relation with their   (4)
       application.

7 a) List any four cladding elements used in Nuclear reactors.   (4)

   b) Explain the PUREX and UREX methods used for extraction of Uranium.   (6)

8 a) Discuss the role of gas centrifuges in fuel enrichment.   (3)

b) Examine the need for fuel enrichment. (3)

c) Illustrate the processes involved in the extraction of uranium from its ore as a block diagram. (4)

PART C

Answer any four full questions, each carries 10 marks.

9 a) Explain the heat transport phenomena with in the fuel element. (5)

b) Identify the major heat losses from reactor fuel and suggest the remedies for the same. (5)

10 a) Compare the heat removal system in a fast breeder reactor with that of a boiling water reactor. (2)

b) Comment on the heat generation in the moderator. (2)

c) Derive heat conduction equation in fuel road. (6)

11 a) Describe biological effects of radiation. (5)

b) State the principles of reactor shielding. (5)

12 a) Evaluate the environmental impacts due to nuclear waste disposal. (4)

b) Summarise the concept of three levels of safety relating to nuclear reactor. (6)

13 a) State the demerits relating to incineration of nuclear wastes. (2)

b) What are the factors to be considered while choosing a reactor site? (2)

c) Explain different types of nuclear wastes and list any five methods of its disposal. (6)

14 a) State the need for reprocessed fuel with regard to nuclear waste management. (4)

b) Write short note on nuclear weapon proliferation. (6)

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