

Name:

Enrolment No:



UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, May 2019

Programme Name: B.TECH (ET-IPR)
Course Name : NUCLEAR POWER GENERATION
Course Code : PSEG 433
Nos. of page(s) : 02

Semester : VI
Time : 03 hrs
Max. Marks : 100

Instructions:

SECTION A

S. No.		Marks	CO
Q 1	Give the full forms for: i. PWR ii. BWR iii. MWhr iv. Fm	4	CO2
Q 2	Describe briefly the concept of <i>Critical mass</i> .	4	CO1
Q 3	Define <i>Binding Energy per nucleon</i> ?	4	CO1
Q 4	Give a proper example for <i>nuclear fission</i> writing a balanced equation with appropriate symbols and numbers.	4	CO1
Q 5	What are Macroscopic (nuclear) cross sections?	4	CO1

SECTION B

Q 6	Safety is an important aspect of Nuclear Power Plant (NPP) support and operations. Based on your understanding of the operations and the possible sources for accidents, suggest some key safety measures for NPPs.	10	CO4
Q 7	Compare in some detail the <i>Thermal</i> and <i>Fast</i> reactors. OR Write a note on Fast Breeder Reactors (FBR).	10	CO2
Q 8	What is the Indian 3 stage Nuclear Program? With the help of a schematic diagram, explain in detail the 3 stages of the program.	4+6	CO5
Q 9	A beam of 1-MeV neutrons of intensity 5×10^8 neutrons/cm ² – sec strikes a thin C ¹² target. The area of the target is 0.5 cm ² and 0.05 cm thick. The beam has a cross sectional area of 0.1 cm ² . At 1 MeV, the total cross section of C ¹² is 2.6 barns. At what rate do interactions take place in the target? What is the probability that a neutron in the beam will have a collision in the target? (N=0.080x10 ²⁴ for carbon)	5+5	CO1

SECTION-C

Q 10	Draw the schematic of a typical closed fuel cycle. Label its each segment and describe briefly their significance.	4+6+10	CO1 +CO2 +CO3 +CO4 +CO5
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Q 11	Classify the different nuclear reactors based on the type of coolant used. Describe any one of them in detail. OR Describe the principle, construction and working of a Light Water Reactor.	20	CO3
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SECTION A

S. No.		Marks	CO
Q 1	Give the full forms for: i. PHWR ii. MWe iii. FBR iv. LMFBR	4	CO2
Q 2	Describe briefly the <i>exotic</i> phenomenon of <i>Electron capture</i> .	4	CO1
Q 3	Explain the phenomenon of (nuclear) fusion with proper example using appropriate symbols and numbers.	4	CO1
Q 4	What is <i>uranium enrichment</i> ?	4	CO1
Q 5	Explain the significance of the <i>binding energy curve</i> .	4	CO1

SECTION B

Q 6	What are Propulsion reactors? Describe their characteristics and their typical uses. OR What are Research reactors? How are they different from the Power reactors? List some important uses for these facilities.	3+4+3	CO2
Q 7	List any 3 major world nuclear accidents and discuss their causes.	3+7	CO4
Q 8	Evaluate the role of Thorium in Indian Nuclear Program.	10	CO5
Q 9	a. Oxygen has 3 isotopes, viz, ^{16}O , ^{17}O and ^{18}O with relative abundances of 99.759, 0.037 and 0.204, and masses 15.99492, 15.99913 and 15.99916 respectively. Compute the atomic weight of naturally occurring oxygen on earth. b. When 0.0253 eV neutrons interact with ^{235}U , only radiative capture and fission can occur as absorption reactions. The cross sections for these reactions are 99 <i>barn</i> and 582 <i>barn</i> respectively. What is the relative possibility for fission to occur under these conditions?	5 5	CO1

SECTION-C

Q 10	What is the difference between an open fuel cycle and a closed fuel cycle? Draw the schematic of a typical open fuel cycle. Label each segment and describe briefly their significance.	4+4+4+ 8	CO1 +CO2 +CO3 +CO4 +CO5
Q 11	<p>Discuss and compare the Pressurized Water Reactors (PWR) and the Boiling Water Reactors (BWR).</p> <p style="text-align: center;">OR</p> <p>Describe the principle, construction and working of a Pressurized Heavy Water Reactor (PHWR).</p>	20	CO3