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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SECOND SEMESTER M.TECH DEGREE EXAMINATION, MAY 2019

Department of Mechanical Engineering

Thermal Engineering

Subject: 03ME6122 Nuclear Engineering

Max.Marks:60 Duration: 3hours

PART-A (Answer All Questions) (4X5=20)

I. What is the difference between atomic number and mass number? What is amu?

II. What do you mean by neutron flux?

III. What is a fertile material? Explain the concept of breeding? Give examples

IV. What do you mean by radiation doze?

PART-B (Answer four questions) (4x10=40)

V (A)

(a) What do you mean by mass defect and binding energy? **(5)**

(b) Calculate the mass defect and binding energy per nucleon of oxygen. Given: m_p= 1.007277 amu, m_n= 1.008665 amu, m_e= 0.00055 amu, atomic mass of oxygen=15.99491amu. **(5)**

OR

V (B) Explain how the neutron cross section varies with the neutron energy. **(10)**

VI (A)

(a) What is power factor formula? **(2)**

(b) A reactor is fuelled with 100 tonnes of natural uranium(atomic mass 238.05) in which the average thermal neutron(2200m/s) flux is 10^{13} neutrons/cm^2s.The 2200m/s cross section of U-235(atomic mass 235.04) are :fission cross section=579 barns and capture cross

section=101 barns. The energy release per fission is 200 MeV and 0.715% of natural uranium is U-235.Calculate the rating of the reactor in MW/tone. **(8)**

OR

VI(B)

(a)Using a schematic diagram, explain a direct cycle BWR plant. **(4)**

(b)Using sketches, explain internal and external recirculation of water in a BWR plant**.** **(6)**

VII (A)

(a)What is Uranium enrichment? What is SWU? **(6)**

(b)Using sketches, explain any one method of Uranium enrichment Method**.** **(4)**

OR

VII(B)

(a)Using a block diagram, explain fuel cycle for LMFBR**(8)**

(b)Define nuclear resource utilization **(2)**

VIII(A)

(a)Why shielding of a reactor is necessary? What do you understand by thermal shielding? **(6)**

(b)What are the desirable properties of a shielding material? **(4)**

OR

VIII(B) Explain how radioactive wastes are disposed off. **(10)**