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EIGHTH SEMESTER

B.Tech. (EP)

MID SEMESTER EXAMINATION

March-2019

EP-412 NUCLEAR MATERIALS FOR ENGINEERING APPLICATIONS

Time: 1.5 Hours

Max. Marks: 25

Note: Answer ALL questions.

Assume suitable missing data, if any.

Q1: i) What is Binding Energy per nucleon? What is its importance with reference to fission and fusion? Explain the difference between prompt and delayed neutrons? (04)

ii) What is the problem with use of fossil fuels in power generation? What are the different alternative sources of energy? France has > 80% electricity from nuclear power plants. Discuss the reasons? (03)

iii) The Helium isotope $_2He^6$ is unstable? What kind of decay would you expect it to undergo? (02)

Q2: i) Find the energy needed to remove a neutron from the nucleus of the Calcium isotope $_{20}Ca^{42}$, ii) Find the energy needed to remove a proton from this nucleus? iii) Why are these energies different? [Masses of $_{20}Ca^{42}$ and $_{20}Ca^{41}$ are 41.983264 u and 40.962278 u respectively and masses of neutron and proton are 1.008665 u and 1.007276 u.] (05)

ii) What limits the size of a stable nucleus? Which nucleus would you expect to be more stable, $_3Li^7$, $_3Li^8$ or $_6C^{13}$ or $_6C^{15}$ and why? (03)

P.T.O.

Q3: i) Discuss any **FOUR** from the following: (4 x 2 = 08)

(a) Magic numbers in the nucleus and density of nucleus

(b) Radioactive decay and Nuclear Reactions

(c) Light water and heavy water, Radiation Hazards

(d) Cross-sections, Alpha and beta decay

(e) Nuclear Forces and limitations of nuclear energy