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BIMEE-017

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B.Tech. MECHANICAL ENGINEERING (BTMEVI)

Term-End Examination

June, 2014

BIMEE-017 : NUCLEAR POWER ENGINEERING

Time : 3 hours *Maximum Marks : 70*

*Note : Attempt **any five** questions. **All** questions carry **equal** marks. Use of Scientific calculator is **permitted**.*

1. (a) What is meant by nuclear fission and nuclear chain reaction ? Outline the conditions necessary for nuclear chain reaction. 7+7

   (b) Draw a labelled diagram of nuclear reactor and discuss the function of each of its main components.

2. (a) Why are nuclear power stations not so popular and successful in our country ? 7+7

   (b) A power of 6 MW is being developed in a nuclear reactor.

   (i) How many atoms of U^{235} undergo fission per second ?

   (ii) How many kg of U^{235} would be used in 1000 hours ?

   Assume that on an average 200 MeV is released per fission.

3. (a) Why is shielding of a reactor necessary ? What do you understand by thermal shielding ? 7+7

(b) 200 MW of electrical power (average) is required for a city. If this is to be supplied by a nuclear reactor of efficiency 20 percent, using U^{235} as the nuclear fuel, calculate the amount of fuel required for one day operation.
Assume that energy released per fission of U^{235} nuclide = 200 MeV.

4. (a) What is a moderator in nuclear reactor ? Explain the desirable properties of good moderator. 7+7

(b) Explain the layout of any one type of nuclear power plant system used in India.

5. (a) What do you understand by the following terms ? 7+7
   (i) binding energy
   (ii) half life
   (iii) isotope
   (iv) coolant
   (v) control rods
   (vi) reflector
   (vii) critical mass

(b) Give the layout of a first breeder reactor power plant and explain its salient features.

6. (a) Discuss the various factors which must be considered while selecting a site for a nuclear power plant. 7+7

(b) Give the construction and working of a "Gas cooled reactor". What are its advantages and disadvantages ?

7. (a) What is "Boiling Water Reactor" (BWR) ? How does it differ from "Pressurised Water Reactor" (PWR) ? 7+7

(b) Discuss in detail the "Pollution from Nuclear Power Plants".