………………**B.E. DEGREE EXAMINATIONS: NOV/DEC 2010**Seventh Semester

MECHANICAL ENGINEERING

U07MEE07: Nuclear Engineering

Time: Three Hours   **Maximum Marks:**

100Answer ALL Questions:-PART A (10 x 1 = 10 Marks)

1. The mass number of nucleus is

   a) always less than its atomic number

   b) always more than its atomic number

   c) sometimes equal to its atomic number

   d) sometimes more than and sometimes equal to its atomic number

2. In nuclear reactions we have conservation of

   a) mass only   b) energy only

   c) momentum only   d) mass and energy, and   momentum

3. Control rods used in nuclear reactor are made of

   a) stainless steel   b) graphite   c) cadmium   d) plutonium

4. Fusion reactions takes place at high temperature because

   a) atoms are ionized at high temperature

   b) molecules break up at high temperature

   c) nuclei break up at high temperature

   d) kinetic energy is high enough to overcome repulsion between nuclei.

5. The function of the moderator in a nuclear reactor is to

   a) stop chain reaction   b) absorb neutrons

   c) reduce the speed of neutrons   d) reduce temperature

6. In the nuclear reactions ------------- isotope of uranium is used

   a) U^{233} (b) U^{234} (c) U^{238} (d) U^{239}

7. The conversion ratio of a breeder reactor is

    a) equal to unity   b) greater than unity   c) equal to unity   d) Zero

8.Thermal shielding is provided to

a) protect the walls of the reactor from radiation damage

b) absorb the fast neutrons

c) protect the operating personnel from exposure to radiation

d) both (b) and (c)

9. Fission of U235 releases --------- energy

   a) 200MeV   b) 238 MeV   c) 431 MeV

10. Which is not a suitable option for the disposal of spent nuclear fuel?

  a). Seal it in deep pools.   b). Monitor it in storage near the ground surface.

  c) . Bury it deep within the Earth.   d). Seal it in a landfill.

PART B (10 x 2 = 20 Marks)

11. What is atomic mass unit? Derive the relation between atomic mass unit and million electron volt (MeV)?

12. What do you mean by half life period?

13. What is the chain reaction in nuclear fission? Describe on what factors does chain reaction depend?

14. Define the term critical mass and critical size.

15. What is reprocessing?

16. Define the term Distribution co-efficient.

17. How are the nuclear reactors classified?

18. What is a moderator in nuclear reactor? Explain the desirable properties of good moderator.

19. How are liquids processed to remove radioactive impurities?

20. List down some safety measures for nuclear power plants.

PART C (5 x 14 = 70 Marks)

21. a) (i) What is radioactive decay? Explain the laws of radioactive disintegration. (7)

    (ii) Derive an expression for mean life time of radioactive element in terms of half life time. (7)

(OR)

  b) (i) What do you understand by the term binding energy and mass defect? State the law of mass energy equivalence. (7)

    (ii) Briefly explain about nuclear cross sections. (7)

22. a) Explain the different methods are used for enrichment of uranium with a neat sketch.

(OR)

  b) (i) Explain the nuclear fission mechanism with a neat sketch. (7)

    (ii) What are the different types of nuclear reaction that takes place? Explain the significance of each in nuclear power generation. (7)

23. a) Explain the spent fuel reprocessing flow diagram with a neat sketch.

(OR)

  b) Explain Purex process for spent fuel reprocessing with a neat diagram.

24. a) Describe with the help of a neat sketch the construction and working of BWR. List out the advantages and disadvantages of BWR.

(OR)

  b) Explain the working principle of MSBR fast breeder reactors with a neat sketch.

25. a) Explain the Loss of Coolant Accident (LOCA) in PWR.

(OR)

  b) Discuss with the help of diagrams, the methods used for treating low level and high level radioactive wastes.

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