



Kafrelsheikh University	  Thermal Power Stations (2)	4 th Year Mech. Power
Faculty of Engineering		Final Exam – May, 2016
Mech. Power Engineering Dept.		Time: 3 hrs.

Question (1)

- “Main steam and hot reheat piping are considered as critical high energy piping systems in the thermal power plant” Justify the statement and explain the various scientific design considerations of piping systems.
- What are principles of electricity generation by nuclear power plants?
- Describe the importance of control materials with respect to reactor safety and control. What are the primary requirements for a control material? Give at least four examples of control materials.
- Give a diagram of Magnox reactor and fast breeder reactor (FBR) and explain their working and main features.
- A nuclear drive in a submarine delivers 25,000 shaft horse power at a cruising speed of 20 knots (1 knot =1.15 miles/h). If the power plant has an efficiency of 25%, how much (in kg) of the ^{235}U fuel is consumed on a 40,000 mile trip around the world?

Question (2)

- Define the multiplication factor and explain why it should be kept slightly greater than unity.
- Consider the collision of a particle of mass m and velocity v with a stationary particle of mass M . Write energy and momentum equations for the collision. Derive an equation for the ratio of the final to the initial kinetic energy of the original moving particle in terms of the masses of both particles. Use the result to show why light atoms are used as moderators.
- If the demand on the generator increases (i.e., a greater load is placed on the turbine), explain what happens to the reactor power of (a) a PWR and (b) a BWR if no operator-caused reactivity changes are made. Which reactor follows the load?

Please turn over

- d. A reactor uses carbon as moderator. If the initial energy of neutron is 3 MeV (*a*) find the ratio of energies per collision (*b*) the number of collisions needed to reduce the energy of neutron to 0.1 eV.

Question (3)

- a. What are the differences between active and passive safety systems for nuclear reactor? Explain the methods for each of them.
- b. Are nuclear plants safe? Explain in detail.
- c. Explain whether the turbine room of a BWR is habitable during normal operation.
- d. Explain the various pollutants emitted from thermal power plants and their treatment methods.

Good Luck