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Total Number of Pages: 02

M.TECH
HTPE106

1st Semester Back Examination 2016-17
THERMAL AND NUCLEAR POWER PLANTS
Branch: HEAT POWER & THERMAL ENGINEERING

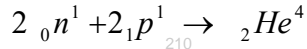
Time: 3 Hour
Max Marks: 70
Q Code: Y989

Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

- Q1** Answer the following questions (2x10)
- Draw T-S diagram of Rankine cycle.
 - What is the function of Deaerator?
 - What is the necessity of draught in a power plant?
 - Define the location of economizer in a water tube boilers.
 - Write two ash removal systems in a boiler.
 - What is the advantage of regenerative feed water heating?
 - Calculate the binding energy of 0.5 a.m.u. mass of nucleus.
 - Calculate the decay constant of Thorium 233 if the half life is 22.1 min.
 - Define life cycle of a neutron.
 - What is the function of a pressurizer?
- Q2** (a) Calculate the overall efficiency of a power plant using the efficiencies of boiler, cycle, turbine and generator. (5)
- (b) A textile factory requires 10 ton/h of steam at 37.3 bar and 344 °C for process heating at 3 bar saturated and 1000 KW of power for which a back pressure turbine of 70% internal efficiency is to be used. Find the steam condition at the exit of the turbine. (The enthalpy of steam at 3 bar saturated condition is 2725.3 kj/kg and at 37.3 bar 344 °C, the enthalpy is 3085.3 kj/kg). (5)
- Q3** (a) Calculate the overall efficiency of Rankine-Rankine series cycles working with two different fluids mercury and steam. (5)
- (b) Describe briefly different types of furnaces used for burning pulverized coal. (5)
- Q4** (a) Distinguish between fire-tube and water tube boilers. (5)
- (b) With neat sketch describe different types of superheaters used for boilers. (5)
- Q5** a) Describe different methods of controlling the superheater temperature. (5)
- b) With neat sketch explain the working principle of air-preheater. (5)

Q6 (a) Explain the working principle of boiling water reactor with suitable diagram. (7)

(b) Calculate the binding energy per nucleon for the Helium atom given below. (3)



Atomic masses of Helium = 4.00387 a.m.u., proton = 1.00759, neutron = 1.00898 a.m.u. and electron = 0.0055 a.m.u.

Q7 (a) Explain the working principle of neutron life cycle. (7)

(b) Calculate the microscopic absorption cross-section of natural Uranium, which consists (3)

of 98% U-237 and 2% U-236. The microscopic cross sections for 0.025eV are: U-237: $\sigma_c = 2.70$ barns, $\sigma_f = 0.02$ barns and U-236: $\sigma_c = 103$ barns, $\sigma_f = 580$ barns.

Q8 Write short notes on any three of the following (10)

a) Pass-out turbine

b) Pressurizer

c) Environmental aspect of power generation.

d) Energy scenario in India.