Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY M. E. - SEMESTER - I • EXAMINATION - WINTER • 2013

Subject code: 713902N Subject Name: Energy conservation System Time: 10.30 am – 01.00 pm

Date: 26-12-2013

Instructions:

- 1. Attempt all questions.
- 2. Make suitable assumptions wherever necessary.
- 3. Figures to the right indicate full marks.
- 4. Use of steam table and Mollier chart is permitted.
- (a) Explain with neat sketch various circuits associate with modern steam 07 **Q.1** power plant and explain at least two circuits in detail.
 - (b) Enlist the principle components of nuclear reactor and explain their 07 functions with neat sketch.
- Q.2 (a) Explain ideal Rankine cycle on P-V and T-S diagrams and derive its 07 efficiency formula for the same and also explain external and internal irreversibility.
 - (b) A superheat Rankine cycle works with a boiler pressure of 50 bar and condenser pressure of 0.08 bar. The steam is superheated to 500° C. determine the following
 - 1. Rankine efficiency
 - 2. Work ratio
 - 3. Specific steam consumption

OR

(b) In a two stage steam turbine working on ideal Rankine cycle, steam enters 07 the first stage at 90 bar and 550° C temperature. Second stage entry temperature after reheating is 550° C. steam is never wet during expansion in both sides. Find the cycle efficiency and specific steam consumption. Also find the steam flow rate in the turbine in kg/sec if the turbine is directly connected to an alternator of 150 MW output. Assume 0.9 as alternate efficiency. Draw T-s diagram for the cycle. Neglect pump work.

Q.3 (a) Explain radioactive decays with all stages along with half life.

(b) Each fission of U-235 yields 190 MeV of useful energy. Assuming that 85% 07 of neutrons absorbed by U-235 cause fission, the rest being absorbed by non fission capture to produce an isotope U-236, estimate the fuel consumption of U-235 per day to produce 3000 MW of thermal power.

OR

- (a) Explain with neat sketch construction of PWR reactor. Q.3
 - (b) A reactor is fuelled with 200 tonnes of natural uranium of atomic mass 07 238.05 in which the average thermal neutron (2200 m/s) flux is 10^{13} neutron/cm².s. The 2200 m/s cross section of U-235 -atomic mass 235.04 are $\sigma_{\rm f}$ = 579 barns and σ_{c} = 101 barns. The energy release per fission is 200 MeV and 0.715 % of natural uranium is U-235. Find
 - 1. The rating of the reactor in MW/tone
 - 2. The rate of consumption of U-235 per day

07

07

Total Marks: 70

- Q.4 (a) Explain the different methods for waste heat recovery.
 - (b) Explain cogeneration and Trigeneration in context of energy along with at **07** least one modern practice.

OR

- Q.4 (a) Give the list of commercially available waste heat recovery devices and 07 explain construction and functions of any one device.
 - (b) Explain construction and operation of L.M. fast breeder reactor. 07
- Q.5 (a) With neat sketch discuss the salient features of circulation fluidized bed 07 (CFB) boilers along with its advantages and disadvantages.
 - (b) What is the purpose of compounding of impulse turbine? Mention the 07 various type of compounding.

OR

Q.5	(a)	What is natural draft? Explain design procedure for "Chimney".	07
	(b)	Write Short note.	07
		(1) Nuclear fission	

(2) Electrostatic precipitator

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