Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

ME Semester –I Examination Feb. - 2012

Subject code: 713902N **Date: 13/02/2012**
Subject Name: Energy Conversion System
Time: 10.30 am – 01.00 pm **Total Marks: 70**
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.**
5.

Q.1 **(a)** Draw the schematic diagram of steam power plant. Also explain coal and ash circuit. **07**

(b) Explain "Neutron Scattering" and also define "Thermal Neutrons" **07**

Q.2 **(a)** Draw and explain reheat Rankine cycle on T-S diagram and show the advantages compared to simple Rankine cycle and also derive relationship for efficiency for the same. **07**

(b) A steam turbine receives steam at pressure 20 bar and superheated 88.6^o C. the exhaust pressure is 0.07 bar and the expansion of steam takes place isentropically. determine the following

1. Net work done
2. Thermal efficiency
3. Theoretical steam consumption

If the actual steam consumption is Kg/kWh what is the efficiency ratio of turbine and actual output at turbine coupling.

OR

(b) In a two stage steam turbine working on ideal Rankine cycle, steam enters the first stage at 95 bar and 575° C temperature. Second stage entry temperature after reheating is 650° 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 160 MW output. Assume 0.85 as alternate efficiency. Draw T-s diagram for the cycle. Neglect pump work. **07**

Q.3 **(a)** Explain effect of variation of steam condition on thermal efficiency of steam power plant. **07**

(b) A reactor is fuelled with 200 tonnes of natural uranium of atomic mass 238.05 in which the average thermal neutron (2200 m/s) flux is 10^{13} neutron/cm^2.s. The 2200 m/s cross section of U-235 –atomic mass 235.04 are σ_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 **07**

1. The rating of the reactor in MW/tone
2. The rate of consumption of U-235 per day

OR

Q.3 **(a)** What is Pinch point? What is its effect on the size and efficiency of the steam generator? **07**

	(b)	Each fission of U-235 yields 190 MeV of useful energy. Assuming that 90% 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 3500 MW of thermal power.	**07**
Q.4	**(a)**	Explain the characteristic features of a HTGR. Why is it called Magnox.	**07**
	(b)	With neat sketch discuss the salient features of circulation fluidized bed (CFB) boilers along with its advantages and disadvantages.	**07**
		OR	
Q.4	**(a)**	State the importance of cogeneration and Trigeneration in context of energy.	**07**
	(b)	Discuss the various methods used of waste heat recovery.	**07**
Q.5	**(a)**	Discuss the principle and working of fusion power reactor with the help of neat sketch.	**07**
	(b)	Give the list of various methods used for governing steam turbine and explain throttling governing in details.	**07**
		OR	
Q.5		Write Short note (1) Nuclear fusion (2) Electrostatic precipitator (3) Dearator (4) Tangential Burner	**14**

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