Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – WINTER 2012

Subject code: 713902N **Date: 09-01-2013**

Subject Name: Energy Conversion Systems

Time: 02.30 pm – 05.00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** With reference to modified Rankine cycle draw and explain reheat cycle. Also explain effect of reheat pressure ratio on cycle efficiency. **07**

(b) Explain modern steam power plant giving its major circuits and explain any one of its circuit in detail. **07**

Q.2 **(a)** Explain Radioactive decay and half life. **07**

(b) A reactor is fuelled with 100 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

(b) The fuel density N for an uranium oxide fuel is given by N = 2.373f X 10^{22} U-235 nuclei/cm^3 where f is the mass fraction of U-235 in the fuel. Determine for a light water moderated uranium reactor the specific energy release rate for the following conditions. **07**

Φ = neutron flux = 10^{13}/cm^{2}s

G = energy per fission = 180 MeV

f = 3.5 % U-235 enrichment

σ_f = 577 barns

Q.3 **(a)** Give the list of various methods used for governing steam turbine and explain throttling governing in details. **07**

(b) A steam power plant is operating on the ideal reheat Rankine cycle. Steam enters the high pressure turbine at 15 MPa and 600°C and is condensed in the condenser at a pressure of 10 KPa. If the moisture content of the steam at the exit of the low pressure turbine is not to exceed 10.4 %, determine, **07**

1. The pressure at which the steam should be reheated before supplying the same to the low pressure turbine and
2. The thermal efficiency of the cycle.

Assume the steam is reheated at constant pressure to a temperature of 600°C. Assume both steam turbines are mounted on same shaft.

OR

Q.3 **(a)** Explain Rankine cycle with necessary diagrams explain and derive efficiency formula for modified Rankine cycle. **07**

(b) In a Rankine cycle steam is supplied to a turbine at 50 bar, 400°C and is expanded to a pressure of 0.2 bar. Find the thermal efficiency of the plant if the reheat pressure is 7 bar and reheated steam temperature 400°C. **07**

Assume isentropic efficiency of turbine as 80 % throughout.

Q.4	**(a)**	Explain the Neutron life cycle.	**07**
	(b)	State the importance of cogeneration and Trigeneration in context of energy.	**07**
		OR	
Q.4	**(a)**	Explain working of CANDU reactor.	**07**
Q.4	**(b)**	Discuss the various methods used of waste heat recovery.	**07**
Q.5	**(a)**	With neat sketch discuss the salient features of circulation fluidized bed (CFB) boilers along with its advantages and disadvantages.	**07**
	(b)	Explain Neutron Energies.	**07**
		OR	
Q.5		Write Short note (1) Nuclear fission (2) Electrostatic precipitator (3) Various Cooling system of Thermal power plant (4) Cyclone separator	**07**

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