Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject code: 713903N Date: 12-01-2013

Subject Name: Optimum Utilization of Heat and Power

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)** Explain the concept of heat pump and heat engine with block diagram and discuss applications in process industries. **08**

(b) Explain co-generation performance calculations. **06**

Q.2 **(a)** Explain Waste Heat Recovery discussing practical limitations in implementations with examples. **06**

(b) For the Heat Exchanger Network Synthesis (HENS) problem following stream information is available: **08**

Stream	T in ºC	Tout ºC	FCp kW/ºC
C1	70	180	30
C2	30	100	20
H1	180	50	25
H2	150	50	40

Draw Hohmann / Lockhart Composite Curves and find out pinch point for ΔT_{min} = 10 ºC.

OR

(b) Write step by step procedure to find out optimum value of ΔT_{min} for heat exchanger network synthesis problem. **08**

Q.3 Based on the information for the streams and utilities given below, design a heat exchanger network using pinch design approach. Use ΔT_{min} = 10 ºK. **14**

Stream	T_{in} ºC	T_{out} ºC	FC_p kW/ºC	h W/m^2 ºC
C1	60	180	300	600
C2	30	105	260	600
H1	180	40	200	700
H2	150	40	400	800
Steam	230	230		5000
CW	25	32		600

OR

Q.3 **(a)** Discuss new trends and modifications in dryer design for energy efficiency. **06**

(b) What is stream splitting? Explain how stream splitting can help to get better heat exchanger network design. **05**

(c) Classify cogeneration systems with respect to prime movers used. **03**

Q.4	**(a)**	Explain the working of Adsorption Refrigeration Systems.	**05**
	(b)	Discuss energy efficiency, performance and limitations of multistage evaporation system.	**09**

OR

Q.4	**(a)**	Discuss major aspects in considerations for deign of Insulation to reduce energy losses.	**07**
	(b)	Using GCC diagram for multistage refrigeration system and explain the saving in work by adopting multistage refrigeration system.	**07**
Q.5	**(a)**	Discuss techno economics of Co-generation.	**07**
	(b)	Explain recuperative heat exchanger for waste heat recovery.	**07**

OR

Q.5	**(a)**	Compare Combined Cycles and Rankine cycle.	**07**
	(b)	Discuss Kalina Cycle giving practical limitations and benefits.	**07**

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