

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} °C	T _{out} °C	FCp kW/°C
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 $\Delta T_{\min} = 10^\circ\text{C}$.

OR

- (b)** Write step by step procedure to find out optimum value of $\Delta T_{\min}$ 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 $\Delta T_{\min} = 10^\circ\text{K}$. **14**

Stream	T _{in} °C	T _{out} °C	FC _p kW/°C	h W/m ² °C
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 design 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**
