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

GUJARAT TECHNOLOGICAL UNIVERSITY

ME Semester –I Examination Feb. - 2012

Subject code: 713903N **Date: 17/02/2012**
Subject Name: Optimum Utilization of Heat & Power
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.**

Q.1 **(a)** Briefly explain topping cycle, bottoming cycle and combined cycle **06**

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

(c) Explain using GCC diagram: How multistage refrigeration is more energy efficient compared to single stage system. **05**

Q.2 **(a)** Briefly explain the concept of heat pump and heat engine. **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	h W/m2 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

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} = 20 ºK. **14**

Stream	T in ºK	Tout ºK	FCp kW/ºK
Liquid, H1	450	325	5
Liquid, H2	400	375	10
	375	374	1000
	374	330	18
Liquid, C1	310	350	8
Vapour, C2	370	460	15
Utilities:			
High Pressure Steam	500	500	
Low Pressure Steam	350	350	
Cooling Water	305	<325	

OR

Q.3 **(a)** Explain optimum temperature driving force, and threshold temperature for design of heat exchanger network. **04**

(b) What is stream splitting? Explain how stream splitting can help in getting better design alternatives for HENS. **04**

(c) Explain Vapour Recompression and Reboiler flashing for increasing thermodynamic efficiency of distillation. **06**

Q.4 **(a)** Compare energy efficiency of Compression Refrigeration and Adsorption Refrigeration Systems. **06**

(b) Explain Recuperative heat exchanger with its advantages and limitations. **08**

OR

Q.4 **(a)** Write steps for pinch design approach to inventing a heat exchanger network. **04**

(b) Find out pinch point for the following network: **10**

	Fcp (MW/K)	Tin (°C)	Tout (°C)
H1	2.376	590	400
H2	1.577	471	200
H3	1.320	533	150
C1	1.600	200	400
C2	1.600	100	430
C3	4.128	300	400
C4	2.624	150	280

Q.5 **(a)** Explain optimum thickness of insulation and heat losses from surface. **07**

(b) Explain Waste Heat Recovery and Heat pipe. **07**

OR

Q.5 **(a)** Discuss Advantages of Cogeneration Technology **05**

(b) Compare Combined Cycles, Rankine Cycles and Kalina Cycle. **09**

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