(2) Figures on the right indicate full marks.
(3) Question No. 1 is **compulsory**.
(4) Attempt any **four** from question No. **2** to **6**.
(5) Use of **T-S** and **h-s** charts **permitted**.

B.E (M) VII R/O Cryogenic Engg. 2/6/07

1.	a)Describe Walker's classification of cryogenic cryocoolers	5
	b)With a neat sketch, describe functioning of Basic pulse tube refrigerator, orifice & double inlet pulse tube refrigerator.	5
	c)Discuss operation of double volume Gifford McMahon refrigerator.	5
	d)Mechanical properties at cryogenic temperature	5
2	a] Show that for an ideal Brayton cycle, $$C.O.P. = T_1/(T_2-T_1) = T_4/(T_3-T_4)$$ Where, T_1 = temp of suction of compressor T_2 = temp of discharge of compressor T_3 = temp at inlet of expander T_4 = temp at outlet of expander	12
	b] Discuss the variation of COP with pressure ratio	8
3.	a)Linde-Hampson cycle cannot be used as it is for Neon, Hydrogen and Helium. Explain.	4
	b)In an ideal liquefaction system derive an expression for work required per unit mass compressed	8
	c)Stating assumptions find an expression for liquid yield & figure of merit (FOM) for a simple L-H cycle.	8
4.	a)Find yield & FOM of an air liquefaction system working on simple L-H cycle. Initial air temp = 300K, PH = 200atm, PL = 1atm, heat exchanger ε = 0.97. Heat gained into liquid receiver = 10kJ/kg of air.	10
	b)For L-H cycle with air as working medium, high & low pressures are 100atm & 1atm, isothermal compression at 300K. Find heat exchanger efficiency at which yield is 80% of max. & compute FOM.	10
5.	a)Explain 'DEEWAR" vessel & transfer lines.	8
	b)Platinum resistance thermometer read a resistance reading of 50Ω. Resistance of 0° C. is 100Ω. Determine the corresponding temp indicated by thermometer for given values of constants. $A = 3.946 * 10^{-3}\ °C^{-1}$ $B = -1.108 * 10^{-6}\ °C^{-2}$ $C = -3.33 * 10^{-12}\ °C^{-4}$	12
6.	Determine the number of theoretical plates required to yield 97% as top product stream & 94% of as bottom product. The feed composition is 79% N_2 & 21% O_2 The feed system is in saturated liquid & bottom product is also in saturated liquids. The desired flow rate is 28kgmol/s. The heat removal at top column is 1100kW. The column operates at a pressure of	20