

- (1-a) Define The following and write the units: State, Cycle, Pressure, Absolute pressure, Gauge pressure, Vacuum pressure. Specific volume, Enthalpy . 5
- (1-b) Defined the heat transfer , what are its modes write the equations for each. 5
- (2-a) Drive an Expression for conduction of heat through a hollow sphere. 5
- (2-b) You have a Double-pipe heat exchange: Drive an Expression for the Log Mean Temperature Difference (LMTD). 5
- (3-a) What are the application of refrigeration? And what kind of refrigeration systems. 5
- (3-b) An air conditioning R-12 system operating with an open type compressor at evaporator temperature of  $4^{\circ}\text{C}$  and a condensing temperature of  $49^{\circ}\text{C}$  has an evaporator load of 67 kW. Air is circulated over the condenser at the rate of  $6.5 \text{ m}^3/\text{s}$ . If the temperature of the air entering the condenser is  $32^{\circ}\text{C}$  and air density is  $1.2 \text{ kg/m}^3$ . Calculate: 5
- (a) The temperature of the air leaving the condenser.
- (b) The LMTD.
- (4-a) Determine the approximate capacity of R-22 refrigerating system connected to a cooling tower, if the evaporating and condensing temperatures are  $-18^{\circ}\text{C}$  and  $37^{\circ}\text{C}$  respectively, the entering and leaving temperatures for the cooling tower are  $35^{\circ}\text{C}$  and  $31^{\circ}\text{C}$  respectively. The system employs an open type condenser and the flow rate of water over the cooling tower is 2. Lit/s. 5
- (4-b) Define and write the symbol and the units of the following: (i) Dry bulb temperature, (ii) Wet bulb temperature (iii) dew point temperature (iv) Specific volume (v) Relative humidity (vi) Humidity percentage. 5
- (5-a) What are the basic processes in conditioning of air by showing these on Psychometric processes. 5
- (5-b) Moist air enters a refrigeration coil at  $32^{\circ}\text{C}$  dry bulb and  $18^{\circ}\text{C}$  wet bulb and at a rate of 500 Lit/s. The surface temperature of the coil is  $5^{\circ}\text{C}$ . If 3.5 tons of refrigeration are available. Find the dry bulb temperature of the air leaving the coil and the moisture removed in Lit/hr. 5