Daffodil International University

Department of Electrical and Electronic Engineering
Faculty of Engineering
Final Examination, Fall – 2025

Course Code: 0715-121 | Course Title: Basic Mechanical Engineering
Section: A, B, C, D, E, F | Level-Term: L1-T2 | Teacher's Initial: RT
Full Marks: 40 | Exam Date: December 20, 2025 | Time: 2 Hours

[Notes: All questions are compulsory]

Q1. **(a)** **Differentiate** the benefits and drawbacks of window type and split type air conditioning system with the help of schematic diagram — **CO-3 (C4)** — **[6]**

(b) On a certain day, the dry and wet bulb temperatures are measured 35 ℃ and 25 ℃ respectively. Using Psychrometric Chart, **Determine**: — **CO-3 (C2)** — **[4]**

- **i.** The relative humidity
- **ii.** The humidity ratio
- **iii.** The dew point temperature of air

Q2. **(a)** **Compare** 4 stroke SI & CI engine with the help of (i) the Actual Indicator Diagram and (ii) TS Diagram. — **CO-1 (C2)** — **[6]**

(b) A six cylinder two stroke engine with a compression ratio r = 10 produces a torque of 1200 Nm at a speed of 1500 rpm. It has a bore (d) of 150 mm and stroke (L) of 180mm. **Determine**: — **CO-1 (C2)** — **[4]**

- **i.** The displacement volume and clearance volume of one cylinder
- **ii.** The engine brake work (Power), and mean piston speed

Q3. **(a)** **Discuss** the working principle of an engine cooling system with a schematic diagram — **CO-1 (C1)** — **[4]**

(b) In a Diesel cycle, Compression begins at 0.15 MPa, 35 ℃. The heat added is 1.95 MJ/kg and the compression ratio is 18. **Determine**: — **CO-1 (C2)** — **[6]**

- **i.** The maximum temperature in the cycle
- **ii.** Work done per kg of air
- **iii.** The cycle efficiency
- **iv.** The temperature at the end of the isentropic expansion
- **v.** The cut-off ratio
- **vi.** The MEP of the cycle

(C_p and C_v of air are 1.005 and 0.718 kJ/kg.K repectively, and the Gas Constant of air , R = 287 J/kg.K)

Q4. **(a)** **Draw** **(i)** the schematic diagram, and **(ii)** T-S diagram of an ideal vapor compression refrigeration system with proper identification and thermodynamic processes — **CO-3 (C2)** — **[6]**

(b) A simple vapor compression refrigeration cycle uses refrigerant- 134a as the working fluid and operates between 0.2MPa and 1.2 MPa. If the mass flow rate of the refrigerant is 0.06 kg/s, **Compute**: — **CO-3 (C3)** — **[4]**

i. The rate of heat removal from the refrigerated space
ii. The power input to the compressor
iii. The rate of heat rejection to the environment, and
iv. The COP of the refrigerant

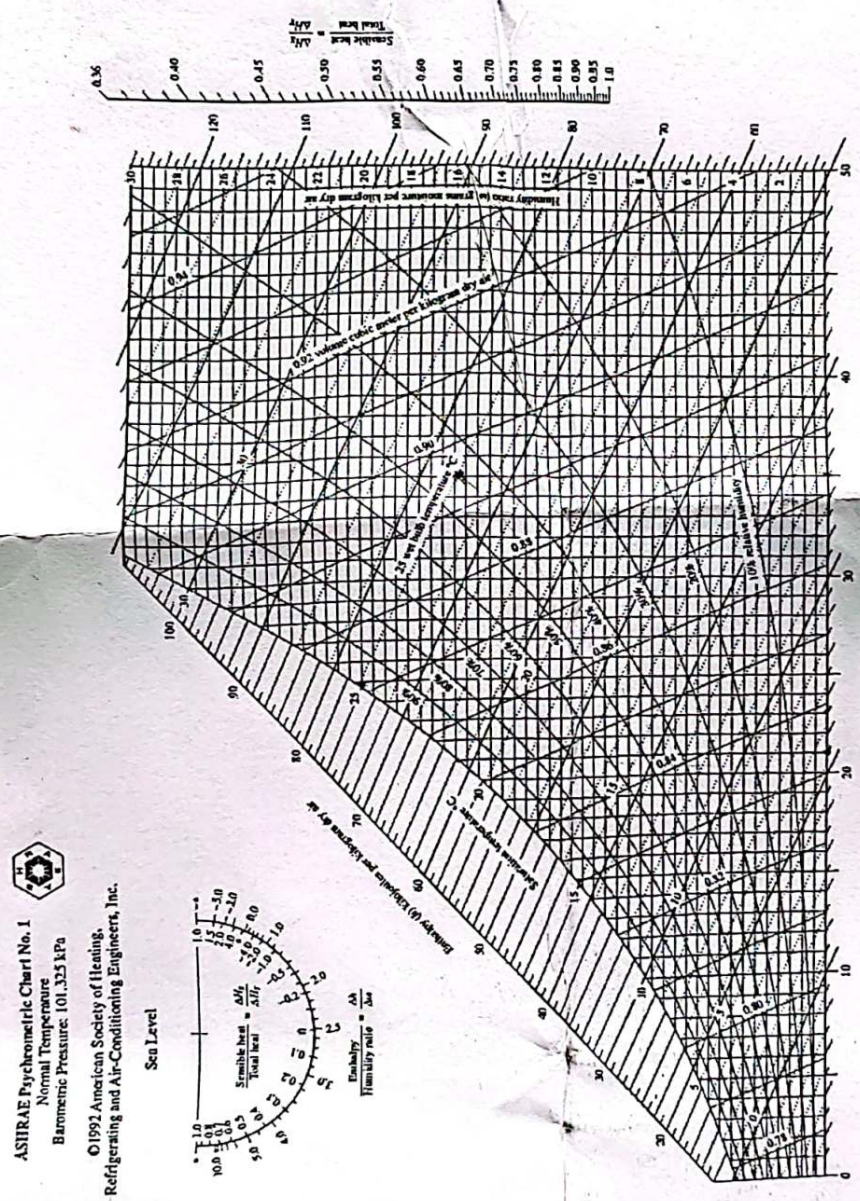

FIGURE A-31
Psychrometric chart at 1 atm total pressure.
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