DEPARTMENT OF MECHANICAL ENGINEERING

VISION

"To incorporate technical & professional skills in Mechanical Engineers to fulfill industrial & social needs".

MISSION

- *To educate, guide, and mentor the students for academic excellence.*
- *To develop technical skills and discipline among the students as per the requirement of the industry.*
- *To impart ethics & social values by arranging social activity.*

Subject Name: Power Engineering and Refrigeration (315371) **Date :-**

Assignment No: - 1 **Course Outcome:502.1**

Topic Name :- Refrigeration

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1. **Define** the following terms with units and typical magnitudes: refrigeration effect, unit of refrigeration (TR), coefficient of performance (COP).
2. **Draw and explain** the **Reverse Carnot refrigeration cycle**.
3. **Describe** the **Bell–Coleman (Reversed Brayton)** cycle. With a clear sketch of the P–V and T–S diagrams.
4. **Compare** the Reverse Carnot and Bell–Coleman cycles in terms of working fluid, practicality, COP, and applications (e.g., aircraft cooling.
5. **Explain** the function of each major component in a VCRS: compressor, condenser, expansion valve, and evaporator. Include a flow diagram. *(3 marks)*
6. Explain subcooling and superheating.
7. **A VCRS uses R‑134a**: evaporation at –10 °C (enthalpy $h_1 = 396$ kJ/kg), condensation at 40 °C ($h_2 = 428$ kJ/kg), and throttling to $h_4 = 256$ kJ/kg.
    - Calculate the refrigeration effect ($h_1–h_4$), compressor work ($h_2–h_1$), and COP.
    - If the mass flow rate is 0.1 kg/s, find the cooling capacity (kW) and required power.

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Subject Name: Power Engineering and Refrigeration (315371) **Date :-**

Assignment No: - 2 **Course Outcome: 502.2**

Topic Name :- Air Conditioning

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1. List and explain the factors affecting human comfort in air conditioning systems.
2. Define -Dry Air ,Moist Air ,Saturated Air ,Dry Bulb Temperature (DBT) ,Wet Bulb Temperature (WBT), Dew Point Temperature (DPT) ,Absolute Humidity ,Relative Humidity ,Specific Humidity, Enthalpy of Moist Air
3. What is a **Psychrometric Chart**? Explain how it is used in HVAC applications
4. Represent any **three psychrometric processes** on a psychrometric chart.
5. Solve the following problems using psychrometric chart or tables:

- (a) A room has air at 30°C DBT and 20°C WBT. Determine RH, specific humidity, and enthalpy.

- (b) Air at 25°C DBT and 50% RH is sensibly heated to 35°C. Find final RH and enthalpy change.

6. Compare window AC, split AC, and cassette AC in terms of:

- Cooling Capacity

- Installation

- Aesthetics

- Maintenance

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Subject Name: Power Engineering and Refrigeration (315371) **Date :-**

Assignment No: - 3 **Course Outcome:502.3**

Topic Name :- I.C Engine Testing and Pollution Control

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1. Define BSFC , MPFI ,MEP,BP,IP.

2. Following observations are recorded during a trial on a four stroke diesel engine : Fuel supplied = 0.1 kg/min. Calorific value of fuel : 41,840 kJ/kg Engine speed : 400 rpm Effective diameter of brake drum = 1 m Net load on the brake drum = 1000 N Mass flow rate of cooling water = 10 kg/min Rise in cooling water temperature = 25 ºC Air supplied : 6 kg/min Exhaust gas temperature : 200 ºC Specific heat of water : 4.186 kJ/kg ºk Specific heat of exhaust gas : 1 kJ/kg ºk Room temperature = 30 ºC Prepare heat balance sheet on minute basis.

3. The following data is collected during a trial of four cylinder petrol engine : B.P. with all cylinder working = 15.8 kW B.P. with cylinder No. 1 cutoff = 11.14 kW B.P. with cylinder No. 2 cutoff = 11.2 kW B.P. with cylinder No. 3 cutoff = 11.36 kW B.P. with cylinder No. 4 cutoff = 11.3 kW Find mechanical efficiency of engine.

4. Explain the effects of pollutants on the environment.

5. Explain Exhaust Gas Recirculation (EGR)

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Subject Name: Power Engineering and Refrigeration (315371) **Date :-**

Assignment No: - 4 **Course Outcome:502.4**

Topic Name :- Air Compressors

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1. Give four classification of air compressors.
2. A single stage air compressor delivers air at 5 bar. The suction temperature and pressure is 20C and 1 bar, respectively, and the volume of air entering the compressor is 2 m3/min. The index of compression is 1.2. Calculate Isothermal efficiency of the compressor.
3. Differentiate between Centrifugal and Reciprocating compressor.
4. Explain the working of a single stage single acting air compressor with a neat sketch.
5. Explain the following terms : (i) Isothermal efficiency 2 (ii) Volumetric efficiency w.r.t. air compressor

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Subject Name: Power Engineering and Refrigeration (315371) **Date :-**

Assignment No: - 5 **Course Outcome:502.5**

Topic Name :- Energy Efficiency in Air Compressor & Refrigeration and Air Conditioning

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1. List the main components of a compressed air system and explain the function of each.
2. Why is there a need for energy management in compressed air systems? Explain with suitable reasons.
3. List factors affecting the performance and energy efficiency of refrigeration systems.
4. Discuss the role of regular maintenance in improving the energy efficiency of air conditioning systems.
5. List and explain five energy saving opportunities in refrigeration and air conditioning systems.