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BASICS OF MECHANICAL ENGINEERING (3110006)

ASSIGNMENT-1 (CO-1)

Chapter-1: Introduction

1. Define zeroth law of thermodynamics, and First law of thermodynamics.
2. Define Melting point, Boiling point and Tripple point of water using Pressure-Volume and Pressure - Temperature diagram.
4. Define the following terms: Prime movers, Internal energy, heat capacity
5. Define specific heats. What type of specific heats is used in practice?
6. Explain different type of system with neat sketch
8. Explain gauge, vacuum, absolute pressure with neat sketch.
9. Write the different sign used for heat and work.
10. Discuss the similarities and dissimilarities between heat and work.

Chapter-2: Fuels and Combustion

1. What is fuel? Discuss different types of fuel in detail.
2. List the non-convectional sources of energy. Prepare a short note on any two types of non-Convectional energy sources
3. Discuss on the calorific value of fuel.
4. State the advantages and disadvantages of liquid fuels over solid fuels.
5. Write short note of different types of coal along with its properties.
6. What is nuclear fuel? State the merit and demerit of the same.
7. Write short note on ozone depletion.
8. Discuss on global warming and its impact on earth.

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ASSIGNMENT-2 (CO-2)

Chapter-1: Properties of Gases:

Q-1: With usual notations prove that Cp – Cv = R

Q-2: Define the following terms: Boyles law, Avogadro's law, Charles Law.

Q-3: Differentiate between gas constant and Universal gas constant.

Q-4: Vessel of 2.5 m^3 capacity contains one kg –mole of nitrogen at 100°C. Calculate the specific volume and pressure if the gas is cooled to 30°C, calculate final pressure, change in specific internal energy and specific enthalpy

Q-5: A gas whose pressure, volume and temp are 3 bar, 0.1 m3 and 190°C respectively has the state changed at constant pressure until the temperature becomes 15°C c. Calculate (i) Heat transferred. (ii) Work done during the process. Take R = 0.29 KJ/kg k & Cp = 1.005 KJ/kg k

Chapter-2: Properties of Steam:

Q-1: Describe the process of formation steam on T-H diagram.

Q-2: Define following terms with respect to steam (i) Dryness fraction (ii) Degree of super heat (iii) Specific volume

Q-3: 1.5 kg of steam at a pressure of 10bar and temperature of 250°C is expanded until the pressure becomes 2.8bar. The dryness fraction of steam is then 0.9. Calculate change in Internal Energy.

Q-4: Explain Throttling Calorimeter with neat sketch.

:Q-5: Calculate the internal energy of 1 kg of superheated steam at a pressure of 10 bar and 280°C. If this steam is to be expanded to a pressure of 1.6 bar and 0.8 kg dry, determine the change in internal energy. Assume specific heat of superheated steam as 2.1k J /kg K

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ASSIGNMENT-3 (CO-3)

Chapter: - HEAT ENGINE AND IC ENGINE

Q-1: Write a difference between SI engine and CI engine.

Q-2: Explain the following terms: volumetric efficiency, compression ratio.

Q-3: With usual notations derive expression to determine efficiency of Otto Cycle.

Q-4: Demonstrate the derivation of equitation for the efficiency of a Diesel cycle with usual notations.

Q-5: Ford car having a four cylinder, four stroke petrol engine has 100 mm bore and stroke is 1.25 times the bore. It consumes 4 kg of fuel per hour having calorific value of 41,000 kJ/kg. The engine speed is 800 rpm. Calculate indicated thermal efficiency if mean effective pressure is 0.75 MPa.

Q-6 A 4-cylinder, two-stroke cycle petrol engine develops 30 kW at 2500 rpm. The mean effective pressure on each piston is 8 bar and mechanical efficiency is 80%. Calculate the diameter and stroke of each cylinder if stroke to bore ratio is 1.5. Also the fuel consumption of engine, if brake thermal efficiency is 28% and calorific value is 43900 kJ/kg.

Q-7 Discuss the construction and working of four stroke Petrol engine

Q-8 Why diesel engines are called C.I. engine? Differentiate between S.I. and C.I. engine.

Q-9 Explain how IC engine classified.

Q-10 Define Brake power, Indicated power and Thermal efficiency.

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ASSIGNMENT-4 (CO-4)

Chapter-1: Steam Boilers

1. How do you classify steam boilers?
2. Differentiate between fire tube and water tube boiler
3. Draw labeled diagram of Babcock and wilcox boiler
4. With neat sketch explain construction and working of water level indicator.
5. Distinguish between Boiler Mountings and Accessories.

Chapter-2: Pumps:

1. Explain single acting reciprocating pump
2. What is priming? Why priming is required in centrifugal pump but not in reciprocating pump.
3. Give comparison between Reciprocating and centrifugal pump.
4. Explain various Methods of Priming in centrifugal pump in brief with neat sketch.
5. Write a short note on vane pump.

Chapter-3: Air Compressors:

1. Explain single acting reciprocating pump.
2. What are the uses of compressed air?
3. Compare reciprocating compressor and rotary compressor.
4. What do you understand by Positive displacement Compressor? How it differs from Rotodynamic compressor?
5. Explain the operation of single stage reciprocating air compressor with clearance. Also draw a P-V diagram for same.

Chapter-4: Refrigeration and Air Conditioning

1. Define Refrigeration and air conditioning.
2. Explain with neat sketch the working of a Vapour compression refrigerator(VCR).
3. Explain with neat sketch the working of a Vapour Absorbation refrigerator(VAR).
4. What do you mean by Comfort Air conditioning?.state the standard air conditioning for human.
5. Explain the working of Window Air conditioner with neat sketch.state their advantages and disadvantages.

Chapter-5: Coulpling, Clutches, Brakes

1. What is coupling? State its functions. Classify the various types of coupling and give examples their applications.
2. Distinguish between Positive clutch and Friction clutch.
3. Explain with neat sketch a Cone clutch.
4. What is Brake? State its functions. how it differs from clutch? how are they classified?
5. Describe with help of neat sketch the working principal of internal expanding shoe brake.

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ASSIGNMENT-5 (CO-5)

Chapter-12: Transmissions of Motion and Power (CO-5)

1. What do you mean by drive? Why they are used instead of directly coupling the prime mover to machine.
2. Compare belt drive, chain drive and gear drive based on following criteria:
Main elements
   - Application suitability w.r.t to distance and velocity ratio
   - Space requirement
   - Slip
   - Design & Manufacturing complexity
   - Life
   - Maintenance

3. Describe briefly using neat diagrams the types of belt drives.
4. Name the different power transmission elements.
5. Write the advantages and disadvantages of belt drives.
6. Why friction drive is not used for heavy power transmission?
7. Write the advantages of chain drive over belt drive.

Chapter-13: Engineering Materials (CO-5)

1. Define following terms.
   - Ductility
   - Elasticity
   - Thermal Conductivity
2. Discuss the following with application and Properties:
   - Glass
   - Ceramic
   - Plastics
3. Show with block diagram, how engineering materials are classified?
4. Write a short note on composite materials.
5. Enlist physical properties of engineering materials.