



Daffodil International University
Department of Electrical and Electronic Engineering
Faculty of Engineering
Mid-Term Examination, Fall – 2024

Course Code: 0715-121
Section: A, B, C
Full Marks: 25

Course Title: Basic Mechanical Engineering
Level-Term: L1-T2
Exam Date: October 5, 2024

Teacher's Initial: SS
Time: 1.5 Hours

*Notes: Question No. 1 is Compulsory)
Answer any Three from the rest of the Four Questions*

- Q1. **Define** the following terms: (Any four) CO-1 [4]
(C1)
- (a) HHV
 - (b) Compounding of Steam Turbine
 - (c) Fuel
 - (d) Boiler Accessories
 - (e) Superheated Steam
- Q2. (a) **Illustrate** the characteristics of a good fuel. Give a few examples of good fuels. CO-1 [2]
(C2)
- (b) A fuel has the following composition by mass: Carbon 88%, Hydrogen 7.5%, Oxygen 2.75%, Sulfur 1.75%. For the complete combustion of 1 kg of fuel, **Determine**: CO-1 [5]
(C3)
- i) The mass of the air to be supplied.
 - ii) The mass of flue gas emitted.
 - iii) The mass of total air to be supplied if 50% excess air is to be provided.
- Q3. (a) **Describe** the reasons why Economizers are used in boilers. **Identify** if they are Mountings or Accessories. **Analyze** how they increase boiler efficiency. CO-1 [3]
(C2)
- (b) **Solve** these problems by showing proper chemical reactions. CO-1 [3+1]
(C3)
- i. Ethanol ($\text{CH}_3\text{CH}_2\text{OH}$) has an HHV of 29.67 MJ/kg. Determine the LHV. (Specific latent heat of vaporization is 2.445 MJ/kg for water at 298 K)
 - ii. What should be the difference between LHV and HHV for burning pure diamond (C)?
- Q4. (a) **Explain** the Boiling Process of water with proper graphical descriptions. CO-1 [2]
(C2)
- (b) **Illustrate** the impracticalities of using the Carnot Cycle in a steam power plant. CO-1 [5]
(C4)
- Describe** how the Ideal Rankine Cycle overcomes these impracticalities with proper diagrams.
- Q5. (a) **Describe** how impulse turbines work. **Differentiate** impulse and reaction turbines in terms of blade and rotor shapes. CO-1 [2]
(C4)
- (b) **Identify** the type of compounding shown in the following figure. Describe the compounding process. CO-1 [5]
(C3)
- Also, **construct** the pressure-velocity diagram for this compounding.

