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Daffodil International University

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

Course Code: 0715-121 | Course Title: Basic Mechanical Engineering
Section: A, B, C | Level-Term: L1-T2 | Teacher's Initial: SS
Full Marks: 25 | Exam Date: October 5, 2024 | 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 (C1) [4]
(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 (C2) [2]

(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 (C3) [5]
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 (C2) [3]

(b) **Solve** these problems by showing proper chemical reactions. CO-1 (C3) [3+1]
i. Ethanol (CH_3CH_2OH) 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)?

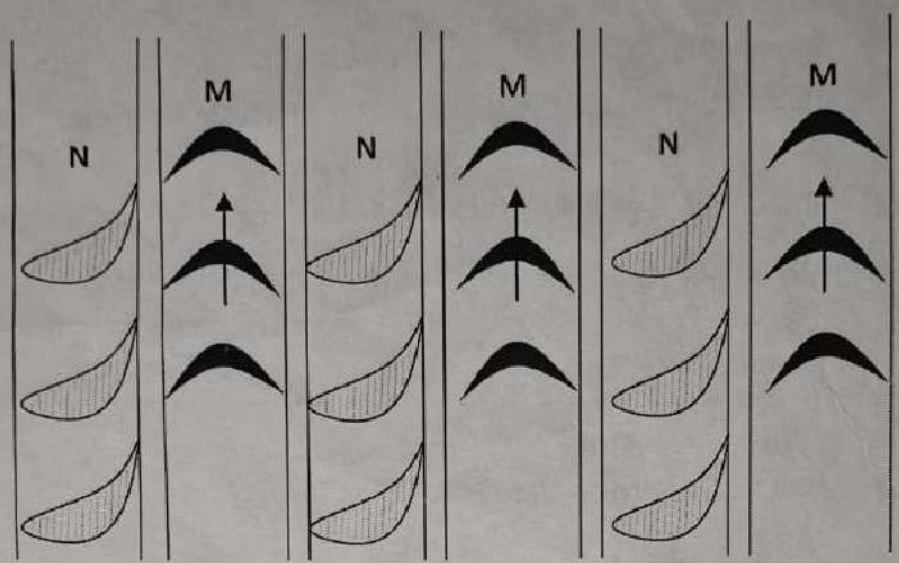
Q4. (a) **Explain** the Boiling Process of water with proper graphical descriptions. CO-1 (C2) [2]

(b) **Illustrate** the impracticalities of using the Carnot Cycle in a steam power plant. **Describe** how the Ideal Rankine Cycle overcomes these impracticalities with proper diagrams. CO-1 (C4) [5]

Q5. (a) **Describe** how impulse turbines work. **Differentiate** impulse and reaction turbines in terms of blade and rotor shapes. CO-1 (C4) [2]

(b) **Identify** the type of compounding shown in the following figure. Describe the compounding process. CO-1 (C3) [5]
Also, **construct** the pressure-velocity diagram for this compounding.

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M = Moving Blade

N = Nozzle

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