

MPE.

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Program: B. Sc. in ME  
Semester: 1st

Date: 11 October, 2023  
Time: 02:30 pm – 04:00 pm

**ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)**  
ORGANISATION OF ISLAMIC COOPERATION (OIC)  
DEPARTMENT OF MECHANICAL AND PRODUCTION ENGINEERING

Mid Semester Examination  
Course Number: ME 4101  
Course Title: Introduction to Mechanical Engineering

Winter Semester: 2022 - 2023  
Full Marks: 75  
Time : 1.5 Hours

There are **03 (three)** questions. Answer **all** questions. The symbols have their usual meanings. Marks of each question and corresponding CO and PO are written in the brackets.

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1. (a) Discuss the significance of the design of aero foil shaped blades in wind turbines. (7+8+10)  
(b) Illustrate the Carnot cycle's schematic and T-S diagram. Also explain why heat rejection to a low temperature sink is necessary for the cycle to function. (CO1) (PO1/PO7)  
(c) Discuss the difference between point function and path function? Also State the difference in operating principles of a refrigerator and a heat pump with proper diagrams.
2. (a) Discuss the accessories that reuse flue gas to enhance a boiler's efficiency. Include T-S and schematic diagrams to illustrate their functions. (13+10+5) (CO1) (PO1/PO7)  
(b) Describe what a quasi-static process is with an example. Also, explain why the efficiency of a steam power plant is limited to around 60%.  
(c) Discuss about the mounting device that ensures high quality steam exit from the boiler.
3. (a) Discuss the working principle of an energy storage-based hydroelectric power plant, including a schematic diagram. (7+10+8) (CO1) (PO1/PO7)  
(b) Discuss the structure and operations of a solar panel with a diagram illustrating the layout of a solar energy system.  
(c) Write a short note on the following topics: (i) Coal formation stages (ii) Nuclear fission process