

CBCS SCHEME



15MN42

Fourth Semester B.E. Degree Examination, June/July 2019 Thermodynamics and Fluid Mechanics

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Define Thermodynamic property. Classify and explain Thermodynamic properties with an example. (08 Marks)
- b. Explain Thermodynamic Equilibrium (06 Marks)
- c. Define Zeroth law of Thermodynamics. (02 Marks)

OR

- 2 a. Derive an expression for workdone at the moving Boundary. (08 Marks)
- b. Define work and heat and explain the sign convention for work and heat. (08 Marks)

Module-2

- 3 a. Give statements and explain Ist and IInd laws of Thermodynamics. (08 Marks)
- b. Prove that Energy is a point function and property of a system. (08 Marks)

OR

- 4 a. Derive an expression for workdone in a single stage compressor without clearance volume. (08 Marks)
- b. A single stage reciprocating air compressor has a swept volume of 2000cm³ and runs at 800rpm. It operates on a pressure ratio of 8, with a clearance of 5% of the swept volume. Assume NTP room conditions and at inlet ($p = 101.3 \text{ Kpa}$, $t = 15^\circ\text{C}$) and polytropic compression and expansion with $n = 1.25$. Calculate i) indicated power ii) Volumetric efficiency iii) mass flow rate iv) free air delivery v) Isothermal efficiency vi) the actual power needed to drive the compressor, if mechanical efficiency is 0.85.. (08 Marks)

Module-3

- 5 a. Derive an expression for capillary rise and capillary fall. (10 Marks)
- b. Explain vapour pressure and cavitations. (06 Marks)

OR

- 6 a. Derive an expression for rate of flow through venturimeter. (10 Marks)
- b. With a neat sketch, explain the working of orifice meter. (06 Marks)

Module-4

- 7 a. Derive an expression for total pressure and center of pressure for an vertical plane surface submerged in liquid. (10 Marks)
- b. With a neat sketch, explain the working of Bourdon's pressure gauge. (06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 8 a. Explain the following ;
i) Buoyancy ii) Metacenter iii) Centre of Buoyancy iv) Metacentric height. (08 Marks)
b. A stone weighs 392.4N in air and 196.2N in water. Compute the volume of stone and its specific gravity. (08 Marks)

Module-5

- 9 a. Derive Bernoulli's equations from Euler's equation of motion and state the assumption made of the same. (10 Marks)
b. State Bernoulli's theorem and write the limitations of Bernoulli's equation. (06 Marks)

OR

- 10 a. Water is flowing through a pipe having diameter 300mm and 200mm at the bottom and upper end respectively. The intensity of pressure at the bottom end is 24.525 N/cm^2 and the pressure at the upper end is 9.81 N/cm^2 . Determine the difference in datum head if the rate of flow through pipe is 40 lit/sec. (08 Marks)
b. Explain Hydraulic gradient line and Total Energy line. (08 Marks)
