

J C Bose University of Science and Technology, YMCA, Faridabad,
Department of Mechanical Engineering
Subject – Applied Thermodynamics
Sessional Test-II (May-2025)
4th Semester (M41&M42)

Time- 90 Minutes

Maximum Marks- 15

Attempt any three questions. All questions carry equal marks.

1. A reciprocating compressor is to be designed to compress 7 kg/min of air from 100 kPa and 25 °C. The compressor delivers compressed air at 2 MPa. The index of compression and expansion, n , is equal to 1.35. Calculate the saving in power consumption and gain in isothermal efficiency, when:
(i). A two-stage compressor,
(ii). A three-stage compressor is used in place of a single stage compressor.
Assume, for two and three stages assume there is perfect Intercooling in the intermediate stages. (CO4)
2. In a stage of an impulse turbine provided with a single row wheel, the mean diameter of blade ring is 90 cm and speed of rotation is 3,500 rpm. The steam issues from nozzles with a velocity of 400 m/s and nozzle angle is 22°. The rotor blades are equal angular and due to friction in the blade channels, the relative velocity of steam at outlet from the blades is 0.80 times the relative velocity in blading when axial thrust on blades is 150 N. Calculate mass flow rate and power developed. (CO2)
3. (a) Discuss the stage efficiency, internal efficiency and reheat factor.
(b) Explain the working of a multistage reciprocating compressor. (CO3)
4. Derive the expression for discharge of mass through the nozzle. (CO2)