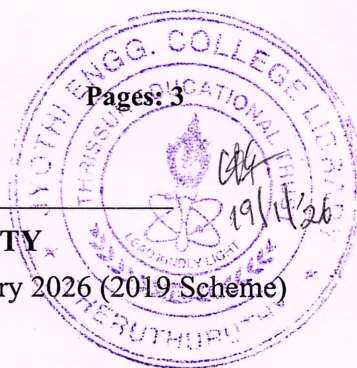


Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S4 (S,FE) (FT/WP) (S2 PT) Examination December 2025/January 2026 (2019 Scheme)



Course Code: MET206

Course Name: FLUID MACHINERY

Max. Marks: 100

Duration: 3 Hours

PART A

(Answer all questions; each question carries 3 marks)

Marks

- | | | |
|----|---|---|
| 1 | Define hydrodynamic thrust. Give two examples of its applications | 3 |
| 2 | Differentiate between inward flow and outward flow reaction turbines | 3 |
| 3 | Explain the function of a surge tank in hydroelectric power plants. | 3 |
| 4 | State any three measures used to prevent cavitation in pumps. | 3 |
| 5 | Explain why actual indicator diagrams differ from ideal indicator diagrams. | 3 |
| 6 | Give any three applications of multistage pumps. | 3 |
| 7 | List three industrial applications of compressors. | 3 |
| 8 | What is an intercooler? Mention its functions in a multistage compressor | 3 |
| 9 | Draw the P-V and T-S diagrams of an ideal Brayton cycle | 3 |
| 10 | Why does reheating increase turbine work? Explain briefly | 3 |

PART B

(Answer one full question from each module, each question carries 14 marks)

Module -1

- | | | |
|----|---|---|
| 11 | a) Derive the equation for force, work done, and efficiency of a jet striking a moving curved vane. | 7 |
| | b) A nozzle of 50 mm diameter delivers a stream of water at 20 m/s perpendicular to a plate that moves away from the jet at 5 m/s Find (1) The force on the plate (2) the work done (3) the efficiency of the plate | 7 |
| 12 | a) Describe the construction and working of a Francis turbine with neat labeled diagrams. | 7 |
| | b) A Pelton wheel is revolving at a speed of 190 rpm and develops 5150.25 kW when working under a head of 220 m with an overall efficiency of 80%. Determine unit speed, unit discharge and unit power. The speed ratio for the turbine is given as 0.47. Find the speed, discharge and power when this turbine is working under a head of 140 m. | 7 |

Module -2

- 13 a) Derive the theory of draft tubes, types of draft tubes, and explain how draft tubes improve turbine performance. 7
- b) Derive the expression for efficiency and degree of reaction of an inward radial flow turbine 7
- 14 a) Draw and explain inlet and outlet velocity triangles of a centrifugal pump and derive work done. 7
- b) Describe the construction and working of a Kaplan turbine with neat sketch. 7

Module -3

- 15 a) Explain slip and negative slip in reciprocating pumps. Derive expressions for coefficient of discharge and volumetric efficiency. 7
- b) Draw an indicator diagram, considering the effect of friction in suction and delivery pipes. Find an expression for the work done per second in case of single-acting reciprocating pump 7
- 16 a) Explain the construction and working of multi-cylinder reciprocating pumps. 7
- b) A single-acting reciprocating pump has a stroke length of 15 cm (0.15m). The suction pipe is 7 m long. The water level in the sump is 2.5 m below the cylinder. The diameters of the suction pipe and the plunger are 7.5 cm (0.075m) and 10.0 cm (0.1m). Take Darcy- Weisbach friction factor $f=0.02$. If the speed of the pump is 75 rpm, determine the pressure head on the piston at the (a) beginning, (b) middle, and (c) end of the suction stroke. 7

Module -4

- 17 a) Derive the expression for work done of a single-stage reciprocating compressor with clearance volume. 7
- b) Explain the classification of compressors. With a neat sketch, describe the working of a single-stage reciprocating air compressor. 7
- 18 a) Explain the working of a Roots blower, vane compressor, and screw compressor 7
- b) Derive the expression for work done during compression (a) without clearance volume and (b) with clearance volume. 7

Module -5

- 19 a) Compare open, closed, and semi-closed gas turbine cycles in terms of working principle, efficiency, and applications. 7

- b) Describe the different types of combustion chambers used in gas turbines. 7
Discuss pressure loss and flame stability considerations

- 20 Air is drawn in a gas turbine plant at 200C and 1 bar. The pressure ratio is 7:1. 14
The compressor is driven by the high-pressure turbine and the output power is taken from low-pressure turbine. The isentropic efficiency of the compressor, high pressure and low-pressure turbines are 80, 82 and 85% respectively. If the maximum cycle temperature is 6400C, determine (i) the pressure and temperature of gases entering the low-pressure turbine (ii) net power developed (iii) work ratio, and (iv) thermal efficiency. Take C_p as 1.005 KJ/kgK and the ratio of specific heats as 1.4.
