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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 as0.47. 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. Discuss pressure loss and flame stability considerations 7

20 Air is drawn in a gas turbine plant at 200C and 1 bar. The pressure ratio is 7:1. 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 Cp as 1.005 KJ/kgK and the ratio of specific heats as 1.4. 14

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