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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S4 (R,S) (FT/WP) / (S2 PT) Examination April 2025 (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		Differentiate between impulse and reaction turbines.	3
2		Derive the expression for efficiency when the jet impinges a moving inclined flat vane.	3
3		What are causes of cavitation in turbines.	3
4		Sketch the velocity triangles of centrifugal pumps and label all the salient velocities and angles	3
5		Explain the term negative slip of a reciprocating pump. Why and when negative slip occurs	3
6		What is a hydraulic ram? Explain its principle and working	3
7		Explain the working and principle of screw compressors.	3
8		Explain the advantages of multistage compression of air.	3
9		Draw the P-V and T-S diagram of Closed cycle gas turbine.	3
10		Sketch the layout of a gas turbine plant with reheating and draw the corresponding T-S diagram..	3

PART B

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

Module -1

11	a)	A jet of water having velocity of 25m/s strikes a series of radial curved vanes mounted on a wheel which is rotating at 250rpm.The jet makes an angle of 25^0 with the tangent to the wheel at inlet and leaves the wheel with a velocity of 5 m/s at an angle of 130^0 to the tangent of wheel at outlet. Water is flowing from outward in the radial direction The outer and inner radii are 0.5m and 0.25m respectively. Determine (i) vane angles at inlet and outlet.(ii) workdone per second per kg of water (iii) efficiency of wheel.	10
	b)	Define the terms speed ratio and jet ratio	4

12 a) An inward flow reaction turbine works under a total head of 30 m. The peripheral velocity of wheel at inlet is 15m/s. The outlet pipe of the turbine is 330mm in diameter and the turbine is supplied with $0.3m^3/s$. The velocity of flow is constant. calculate (i) vane angle at inlet (ii) guide vane angle (iii) power of turbine. 10

b) Explain about gross, effective and net head. 4

Module -2

13 a) Derive an expression for the minimum speed for starting a centrifugal pump 6

b) A centrifugal pump runs at 1000 rpm with their vane angles at inlet and outlet as $20^0$and 35^0 respectively. The internal and external diameters are 25cm and 50cm respectively. Find the work done per N of water assuming velocity of flow as constant. Assume the water enters radially into the pump. 8

14 a) With a neat sketch explain the working of Governing system of a Pelton Turbine 7

b) Two geometrically similar pumps are running at the same speed of 750rpm one pump has an impeller diameter of 0.25m and lifts the water at the rate of 30lit/s against a head of 20m. Determine the head impeller diameter of other pump to deliver half discharge. 7

Module -3

15 a) Illustrate an indicator diagram that takes into account the impact of friction and acceleration in the supply and suction pipes. Determine the work done per second expression for a single working reciprocating pump. 7

b) A single acting reciprocating pump running at 60 rpm delivers $0.53m^3$ of water per minute. The diameter of the piston is 200mm and stroke length 300mm. The suction and delivery heads are 4m and 12 m respectively. Determine the (i) theoretical discharge (ii) coefficient of discharge (iii) percentage slip of pump and (iv) power required to run the pump. 7

16 a) Explain with neat sketch, the working of jet pump, gear pump and lobe pump 7

b) What is an Air vessel? Explain its function with neat sketch. 7

Module -4

17 a) Explain with suitable diagram the working of root blower. 7

b) Explain the working of axial flow compressors also draw its velocity triangles. 7

18 a) Derive the expression for workdone by a single stage reciprocating compressor during polytropic process with the effect of clearance volume 7

b) A single acting reciprocating air compressor has a piston diameter of 200mm and a stroke of 300mm and runs at 350rpm.Air is drawn at 1.1 bar and is delivered at 8 bar and obeys the law $PV^{1.35}=C$ and the clearance volume is 6% of stroke volume. Determine the mean effective pressure and power required to drive the compressor. 7

Module -5

19 a) Prove that the pressure ratio for maximum work is a function of limiting temperature ratio. 7

b) Explain about the main types of combustion chambers. 7

20 a) In an oil gas turbine installation it is taken at pressure of 1bar and 27^0C and compressed to a pressure of 4bar. The oil with a calorific value of 42000kj/kg is burnt in the combustion chamber to raise the temperature to 550^0C. if the air flows at the rate of 1.2 kg/s. Find the net power of the installation. Also find air fuel ratio. C_p =1.05KJ/kgK 10

b) Explain about combustion efficiency and stability loops. 4

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