Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fourth Semester B.Tech Degree (S,FE) Examination August 2021 (2015 Scheme)

Course Code: ME200

Course Name: FLUID MECHANICS AND MACHINERY (MC, SF)

Max. Marks: 100 Duration: 3 Hours

PART A

Answer any three questions. Each question carries 10 marks.

1 Two square flat plates with each side 60 cm are spaced 12.5 mm apart. The lower plate is stationary and upper plate requires a force of 100 N to keep it moving with a velocity of 2.5 m/s. The oil film between the plates has same velocity as that of the plates at the surface of contact. Assuming linear velocity distribution, determine: (10)

i. the dynamic viscosity of the oil in poise and

ii. the kinematic viscosity of oil in stokes if the specific gravity of oil is 0.95.

2 a) Define surface tension. Prove that the relationship between surface tension and pressure inside a hollow bubble in excess of outside pressure in given by $p = \frac{8\sigma}{d}$ (5)

b) Define cavitation. How does cavitation affect hydraulic machinery? (5)

3 State and prove Hydrostatic law. (10)

4 A solid cylinder of diameter 4.0 m has a height of 3 metres. Find the meta-centric height of the cylinder when it is floating in water with its axis vertical. The specific gravity of the cylinder = 0.6. (10)

PART B

Answer any three questions. Each question carries 10 marks

5 a) Derive an expression for Euler's equation of motion for steady and incompressible flow. (6)

b) Distinguish between i. laminar and turbulent flow ii. rotational and irrotational flow. (4)

6 Three pipes of lengths 800 m, 500 m and 400 m and of diameters 500 mm, 400 mm and 300 mm respectively are connected in series. These pipes are to be replaced by a single pipe of length 1700 m. Find the diameter of the single pipe. (10)

7	a)	A 30 X 15 cm venturimeter is inserted in a vertical pipe carrying water, flowing in the upward direction. A differential mercury manometer connected to the inlet and throat gives a reading of 20 cm. Find the discharge. Take Cd = 0.98.	(6)
	b)	Distinguish between notch and weir.	(4)
8		Define: laminar boundary layer, turbulent boundary layer, laminar sub-layer and boundary layer thickness.	(10)

PART C

Answer any four questions. Each question carries 10 marks.

9		Distinguish between impulse and reaction turbines. Explain the working of an axial flow reaction turbine.	(10)
10		A Pelton wheel is to develop 13250 kW under a net head of 800 m while running at a speed of 600 rpm. If the coefficient of jet = 0.97, speed ratio = 0.46 and the ratio of jet diameter is 1/15 of wheel diameter. Calculate (a) number of jets (b) diameter of jets (c) diameter of pitch circle (d) quantity of water supplied to wheel. Assume overall efficiency as 85%.	(10)
11	a)	What is a surge tank? What are its purposes?	(4)
	b)	Explain the different types of draft tubes with neat sketch.	(6)
12	a)	With a neat sketch, explain ideal indicator diagram.	(7)
	b)	Explain the purpose of fitting an air vessel to a reciprocating pump.	(3)
13	a)	What is an impeller? What are the functions of an impeller in a centrifugal pump?	(4)
	b)	Explain the different types of impellers used in a centrifugal pump.	(6)
14		A centrifugal pump having outer diameter equals to two times the inner diameter and running at 1200 rpm works against a total head of 32 m. the velocity of flow through the impeller is constant and equal to 3 m/s. the vanes are set back at an angle of 30^0 at outlet. If the outer dimeter of the impeller is 600 mm and width at outlet is 50 mm, determine:	(10)

i. Vane angle at inlet

ii. Work done per second by the impeller

iii. Manometric efficiency