

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 is 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 $C_d = 0.98$. (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° at outlet. If the outer diameter of the impeller is 600 mm and width at outlet is 50 mm, determine: (10)
- Vane angle at inlet
 - Work done per second by the impeller
 - Manometric efficiency