Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fourth Semester B.Tech Degree (S,FE) Examination June 2022 (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	a)	Determine the bulk modulus of elasticity of a liquid, if the pressure of the liquid is increased from 70 N/cm^2 to 130 N/cm^2. The volume of the liquid decreases by 0.15 per cent.	5
	b)	Prove that the pressure intensity inside a hollow bubble increases with decrease in bubble diameter.	5
2		An oil film of thickness 1.5 mm is used for lubrication between a square plate of size 0.9 m x 0.9 m and an inclined plane having an angle of inclination 20^0. The weight of the square is 392.4 N and it slides down the plane with a uniform velocity of 0.2 m/s. Find the dynamic viscosity of the oil.	10
3		Explain how to find the resultant pressure on a curved surface immersed in a liquid	10
4	a)	How will you determine the meta-centric height of a floating body experimentally? Explain with neat sketch.	5
	b)	A wooden block of width 2 m, depth 1.5 m and length 4 m floats horizontally in water. Find the volume of water displaced and the position of centre of buoyancy. The specific gravity of wooden block is 0.7.	5

PART B

Answer any three questions. Each question carries 10 marks

5		State Bernoulli's theorem for steady flow of an incompressible fluid. Derive an expression for Bernoulli's theorem from the first principle and state the assumptions made for such a derivation.	10
6	a)	Explain major losses and minor losses in pipes.	5
	b)	Explain hydraulic gradient line and total energy line	5

7 Find the discharge of water flowing through a pipe 20 cm diameter placed in an inclined position, where a venturimeter is inserted, having a throat diameter of 10 cm. The difference of pressure between the main and throat is measured by a liquid of specific gravity 0.4 in an inverted U-tube, which gives a reading of 30 cm. The loss of head between the main and throat is 0.2 times the kinetic head of pipe. 10

8 Explain boundary layer separation. What is the effect of pressure gradient on boundary layer separation? 10

PART C

Answer any four questions. Each question carries 10 marks.

9 A jet of water of diameter 100 mm strikes a curved plate at its centre with a velocity of 15 m/s. The curved plate is moving with a velocity of 7 m/s in the direction of the jet. The jet is deflected through an angle of 150^0. Assuming the plate smooth, find i. force exerted on the plate in the direction of the jet, ii. Power of the jet, and iii. Efficiency. 10

10 A Kaplan turbine runner is to be designed to develop 9100 kW. The net available head is 5.6 m. If the speed ratio = 2.09, flow ratio = 0.68, overall efficiency = 86% and the diameter of the boss is 1/3 the diameter of the runner. Find the dimeter of the runner, its speed and the specific speed of the turbine. 10

11 a) With the help of neat sketch, explain the governing mechanism of Francis Turbine 6

b) Explain the difference between Kaplan turbine and propeller turbine 4

12 Define indicator diagram. Prove that area of the indicator diagram is proportional to the work done by the reciprocating pump. 10

13 a) Compare centrifugal pump and reciprocating pump 5

b) Define slip, percentage slip and negative slip of a reciprocating pump. 5

14 Find the power required to drive a centrifugal pump which delivers 0.04 m^3/s of water to a height of 20 m through a 15 cm diameter pipe and 100 m long. The overall efficiency of the pump is 70% and the coefficient of friction 'f' = 0.015 in the formula $h_f = \frac{4fLV^2}{2gd}$ 10

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