MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

III SEMESTER B.TECH. (AERONAUTICAL ENGINEERING)

END SEMESTER ONLINE PROCTORED EXAMINATIONS (PART B), JAN 2022

SUBJECT: FLUID MECHANICS [AAE 2156]

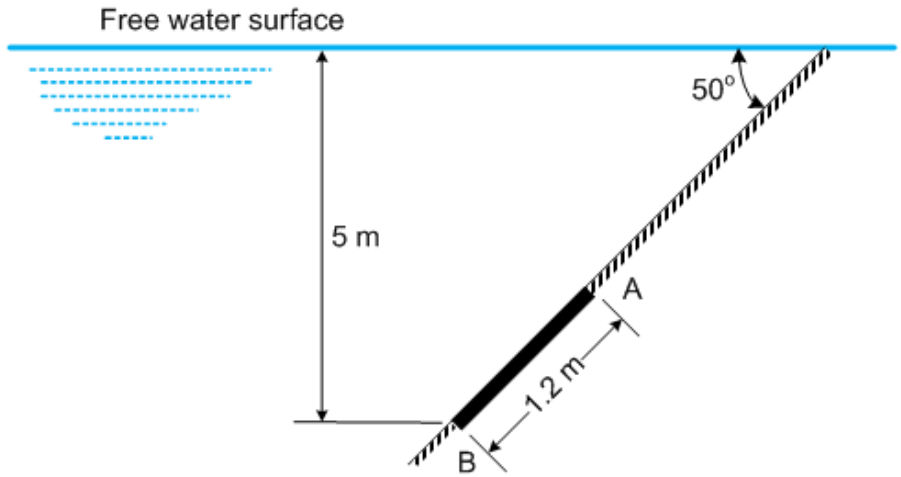
REVISED CREDIT SYSTEM

(31/01/2022)

Duration: 75 minutes Max. Marks: 20

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data if any, may be suitably be assumed.
- Use of supplied data sheet is permitted

Q. No	Question	Max. Marks	CO	BT Level
1A	An inclined rectangular sluice gate AB is 1.2 m x 5 m (as shown in figure) is installed to control the discharge of water. The end A is hinged. Determine the force normal to the gate applied at point B to open it. 	(3)	CO2	L5
1B	Briefly describe the following. 1. Drag in submerged bodies 2. Coefficient of velocity 3. Transient flow 4. Critical Reynolds number 5. Energy thickness of boundary layer 6. Pitot static probe	(3)	CO1 CO2 CO3 CO4 CO5	L2

1C	The ratio of lengths of a submarine and its model is 20:1. The speed of the sub-marine prototype is 10 m/s. The model is to be tested in a wind tunnel. Find the speed of air in the wind tunnel and the ratio of drag between the model and prototype. Take the value of kinematic viscosity for sea water and air as 0.012 stokes and 0.016 stokes, respectively. The density of sea water and air are given as 1030 kg/m^3 and 1.24 kg/m^3, respectively.	(4)	CO4	L5
2A	Find the displacement and momentum thickness for the velocity distribution given by $$\frac{u}{U} = 2\left(\frac{y}{\delta}\right) - \left(\frac{y}{\delta}\right)^2$$	(4)	CO3	L5
2B	A fluid field is given by $V = x^2y\,i + y^2z\,j - (2xyz + yz^2)\,k$. Prove that it is a case of possible steady incompressible flow field. Calculate the velocity and acceleration at the point (2,1,3).	(3)	CO2	L5
2C	With suitable figures, explain the conditions of equilibrium of submerged and floating bodies.	(3)	CO2	L2