	ADAMAS UNIVERSITY		
(ADAMAS logo) PURSUE EXCELLENCE	**END-SEMESTER EXAMINATION : JANUARY 2021** (Academic Session: 2020 – 21)		
Name of the Program:	B.Tech in Mechanical Engineering	**Semester:**	III
Paper Title:	Fluid Mechanics	**Paper Code:**	EME42113
Maximum Marks:	40	**Time duration:**	3:00 hours
Total No of questions:	8	**Total No of Pages:**	02
(Any other information for the student may be mentioned here)			

Answer all the Groups
Group A
Answer all the questions of the following $5 \times 1 = 5$

1. a) For a two-dimension flow field the equation of a stream line is given by……….
    b) What is the dimension of Kinematic Viscosity? (In terms of MLT)
    c) What is the relation between the C_d, C_c and C_v?
    d) The continuity equation of 3-D is………………… valid for steady and incompressible fluid.
    e) What is stream function and velocity potential function?
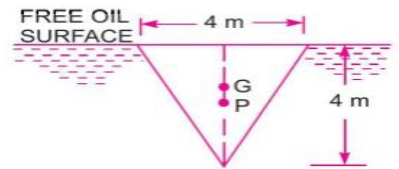
GROUP –B
Answer *any three* of the following $3 \times 5 = 15$

1. The velocity field in a fluid flow is given by, $V=x^2yi-y^2zj+(2xyz+yz^2)$ k. Determine the magnitudes of velocity and acceleration at (1,1,2).

2. The velocity potential function is given by
    $$\phi = -\frac{xy^3}{3} - x^2 + \frac{x^3y}{3} + y^2$$

    i) Find the velocity components in x and y direction. (3)

    ii) Show that φ represents a possible case of flow. (2)

3. The dynamic vescosity of an oil used for lubrication between a shaft and sleeve is 6poise. The shaft is of φ=0.4m and rotate at 190r.p.m calculate power lost in the bearing for a sleeve length of 90mm.the thickness of the oil film is 1.5mm. (As shown in Fig.)
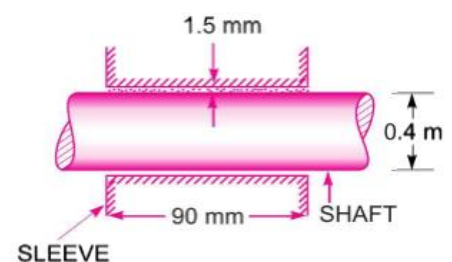
4. Determine the total pressure and center of pressure on an isosceles triangular plate of base 4m and altitude 4m when it is immersed vertically in an oil Sp. Gr. 0.9. The base of the plate coincides with the free surface of oil. (As shown in Fig.)


GROUP –C

Answer *any two* of the following $2 \times 10 = 20$

5. i) Derive the expression of Continuity equation in 3-D for cartesian co-ordinate system. (6).

ii) An inverted U-Tube manometer is connected to two horizontal pipes A and B through which water is flowing. The vertical distance between the axes of these pipes is 30cm. When an oil of Sp. Gr. 0.8 is used as a gauge fluid, the vertical height of water column in the two limbs of the inverted manometer (when measured from the respective centre lines of the pipes) are found to be same and equal to 35cm. Determine the difference of pressure between the pipes. (As shown in Fig.) (4)
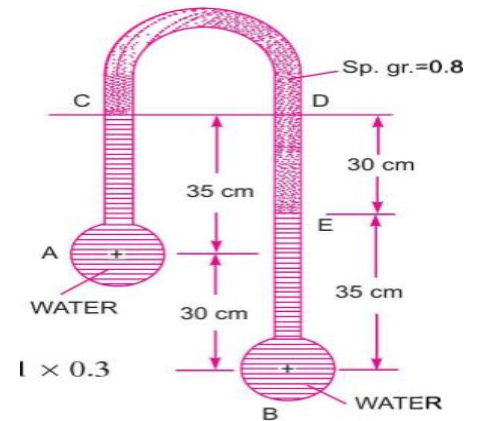

6. i) Find the discharge of water flowing through a pipe 30cm diameter placed in an inclined position where a venturi -meter is inserted, having a throat diameter of 15cm. the difference of pressure between the main and throat is measured by a liquid of sp. Gr. 0.6 in an inverted U tube which gives a reading of 30cm. The loss of head between the main and throat is 0.2times the kinetic head of the pipe. (As Shown in Fig.) (6)
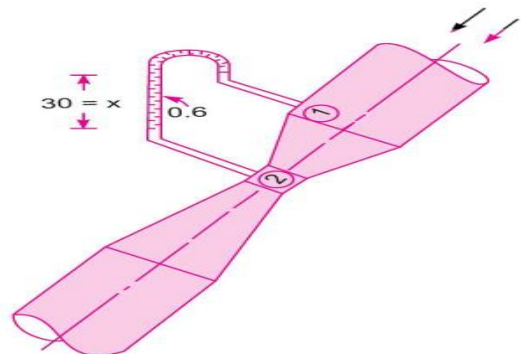
ii) A rectangular sluice gate is situated on the vertical wall of a lock. The vertical side of the sluice is d meters in length and depth of centroid of the area is p m below the water surface (As shown in Fig.)
Prove that the depth of pressure is equal to $(p+d^2/12p)$. (4)
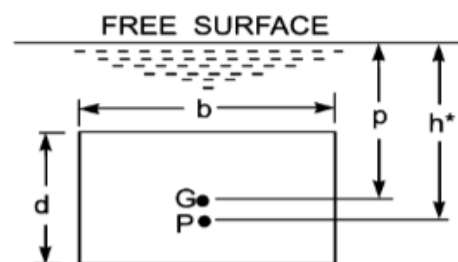
7. i) Derive the expression of total force and Centre of Pressure of an inclined plane surface submerged in liquide. (6)

ii) Define the term of Specific Gravity, Specific Weight & Specific Volume with their S.I units. (4)

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