KERALA AGRICULTURAL UNIVERSITY
B. Tech. (Food Technology) 2024 Admission
III Semester Final Examination – January 2026

FPE 2105   **Fluid Mechanics (2+1)**   Marks: 50
Time: 2 hours

I   **Match the following**   (10x1=10)

1.

i) Stable equilibrium	a) M is below G
ii) Unstable equilibrium	b) M and G coincide
iii) Neutral equilibrium	c) M is above G

Answer the following

2. Define continuity equation.
3. Define metacentric height.

Fill in the blanks

4. Bulk modulus of elasticity K=
5. The flow of fluid along the curved path known as
6. The mechanical efficiency of centrifugal pump is=
7. Surface tension on a liquid jet =
8. Specific speed of centrifugal pump N_s =
9. Co-efficient of discharge for external mouthpiece =
10. The velocity of approach is given by=

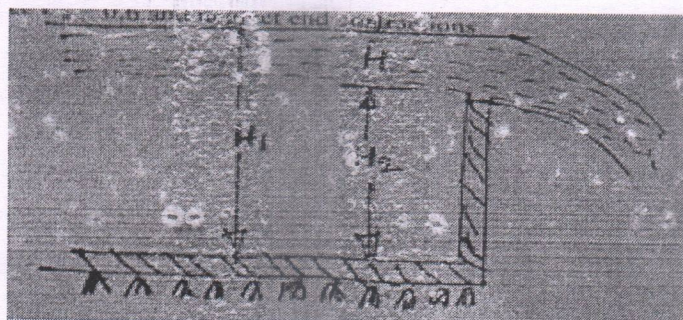**II**   **Write short notes on ANY FIVE of the following**   (5x2=10)

1. State Newton's law of viscosity.
2. Write about the surface tension on a hollow bubble.
3. What are the types of fluid flow?
4. How will you determine the loss of head due to friction in pipes by using Chezy's formula?
5. Describe the Rayleigh's method for dimension analysis.
6. What is the Froude's number.
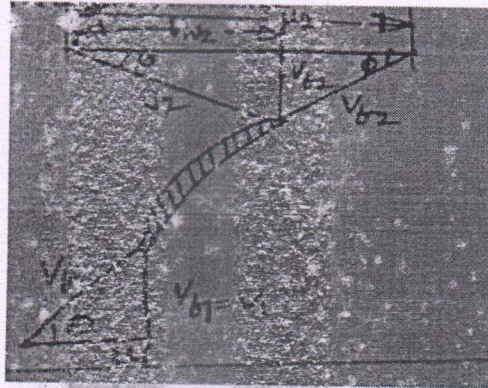7. Write about the suction head, delivery head and static head.

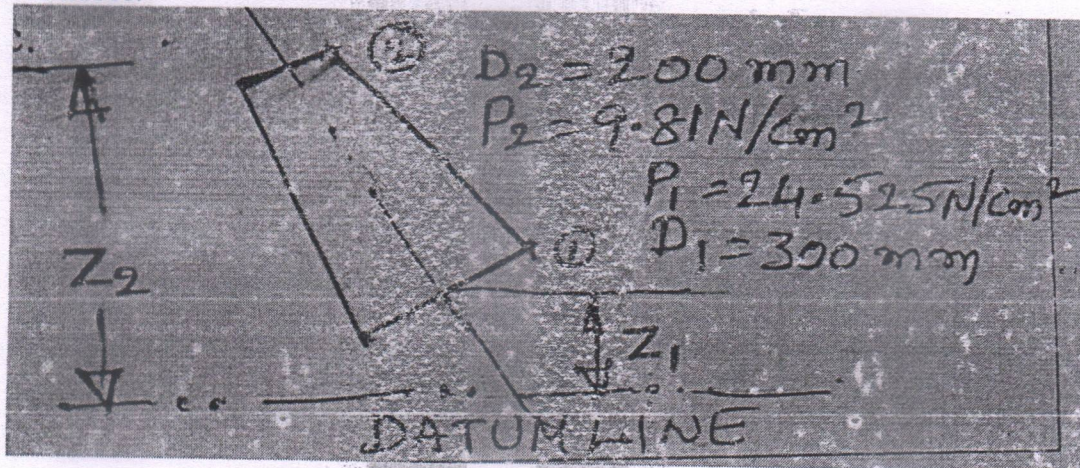**III**   **Answer ANY FIVE of the following**   (5x4=20)

1. The velocity vector in a fluid flow is given by
   $V = 4 x^3 i - 10 x^2 y j + 2 t k$. Find the velocity and acceleration of a fluid particle at (2,1,3) at time t=1.

2. An oil of sp.gr.0.8 is flowing through a horizontal venturimeter having inlet diameter 20cm and throat diameter 10 cm .The oil mercury differential manometer shows reading of 25 cm. Calculate the discharge of oil though the venturimeter .Take $C_d = 0.98$

3. Determine the height of rectangular weir of length 6 m to be built across a rectangular channel. The maximum depth of water on the up stream side of the weir is 1.8 m and discharge is 2000 liters/s.
   Take $C_d = 0.6$ and neglect end contractions.

4. Derive an expression for the loss of head due to sudden contraction of a pipe.

5. Find the expression for the power P developed by a pump when P depends upon the head H, the discharge Q and specific weight w of the fluid.

6. The outer diameter of impeller of a centrifugal pump is 400 mm and outlet width is 50 mm. The Pump is running at 800 rpm and working against a total head of 15 m. The vane angle at outlet is 40^0 and monomeric efficiency is 75%. Determine
   (i) Velocity of flow at outlet
   (ii) Velocity of water leaving the vane
   (iii) Angle made by the absolute velocity at outlet with the direction of motion at outlet
   (iv) Discharge

7. Water is flowing through a pipe having diameter 300 mm and 200 mm at the bottom and upper end respectively. The intensity of pressure at the bottom end is 24.525 N/cm^2 and the pressure at the upper end is 9.81 N/cm^2. Determine the difference in the datum head. If the rate of flow through pipe is 40 lit/sec.

IV   **Write an essay on ANY ONE of the following**   (1x10=10)
   1. Describe the working of a reciprocating pump
   2. How are the inverted U- tube differential manometer is used for pressure difference

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