b) The friction factor in a laminar flow through pipe in $0.016 m^3/sec$. What is it's Reynold number?

c) What is stoke's law?

d) Write a note on losses during flow through a pipe.

OR

A pipe 100mm in diameter and 40m long conveys water at a velocity of 2.5 m/s. If a 200mm diameter pipe replaces central 20m length of pipe. Find the saving in head loss. Assume that changes in section are sudden. Take f = 0.01 and coefficient of contraction $C_c = 0.62$.

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Roll No .....

AU/CE/IP/IEM/PR/ME - 405

B.E. IV Semester

Examination, December 2015

Fluid Mechanics

Time : Three Hours

Maximum Marks : 70

Note: i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.

ii) All parts of each questions are to be attempted at one place.

iii) All questions carry equal marks, out of which part A and B (Max.50 words) carry 2 marks, part C (Max.100 words) carry 3 marks, part D (Max.400 words) carry 7 marks.

iv) Except numericals, Derivation, Design and Drawing etc.

1. a) State Pascal's law.

b) What is meant by centre of pressure? How does it vary with depth of fluid?

c) Discuss the condition of equilibrium of a floating body.

d) A rectangular plate 0.6m×1.2m is submerged in an oil bath of specific gravity 0.8. The maximum and minimum depth of the plate are 1.6m and 0.75m from the free surface. Calculate the hydrostatic face on face of the plate and the depth of centre of pressure.

OR

A wooden cylinder of specific gravity 0.6 and circular in cross-section is required to float in oil (Specific gravity 0.90). Find the L/D ratio for the cylinder to float with it's longitudinal axis vertical in oil. Find L/D ratio for the cylinder to float with its longitudinal axis vertical in oil, where L in height of cylinder and D is its diameter.

2. a) Distinguish between steady and unsteady flow.

   b) Define velocity potential function and stream function.

   c) Explain uniform flow with source and sink.

   d) If for a two-dimensional potential flow, the velocity potential is given by $\phi = 4x(3y - 4)$, determine the velocity at the point (2, 3). Determine the steam function at this point also.

OR

The velocity components in a two dimensional flow are $u = 8x^2y\frac{-8}{3}y^3$ and $v = -8xy^3 + \frac{8}{3}x^3$. Show that these velocity components represent a possible case of an irrotational flow.

3. a) Name the different faces present in a fluid flow.

   b) What is venturimeter? State the expression of discharge through venturimeter.

   c) Define moment of momentum equation. Where this equation is used?

   d) Derive Bernoulli's theorem for steady flow of an incompressible fluid from consideration of momentum.

OR

An orifice meter with orifice diameter 10cm is inserted in a pipe of 20cm diameter. The pressure gauges fitted upstream and downstream of the orifice meter gives readings of 19.62 N/cm^2 and 9.81 N/cm^2 respectively. Coefficient of discharge is given as 0.6. Find the discharge of water through pipe.

4. a) Define fundamental units and derived units.

   b) Define Reynold's number and Froude's number.

   c) What do you understand by model analysis?

   d) The resisting face R of a supersonic plane during flight can be considered as dependent upon the length of the aircraft l, velocity V of air viscosity μ, air density ρ and bulk modulus of air K. Explain the functional relationship between these variables and the resisting force.

OR

A 1:20 model of a flying boat is towed through water. The prototype is moving in sea water of density 1024kg/m^3 at a velocity of 15m/sec. Find the corresponding speed of the model. Also determine the resistance due to waves on model, if the resistance due to waves of prototype is 500N.

5. a) Differentiate between laminar and turbulent flow.