Question Paper Code : T3020

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2009

Third Semester

Civil Engineering

CE 2202 — MECHANICS OF FLUIDS

(Regulation 2008)

Time : Three hours

Maximum : 100 Marks

Answer ALL Questions

PART A — (10 × 2 = 20 Marks)

How are fluids classified based on Newton’s law of viscosity? Give one example for

any two types of fluid.

At a certain point in castor oil the shear stress is 0.216 N/m2 and the velocity gradient

is 0.216 s–1. If the mass density of castor oil is 959.42 kg/m3, find kinematic

viscosity.

Define vacuum pressure and give its mathematical expression.

Define Streamline and pathline in fluid flow.

What are the basic assumptions made in deriving Bernoulli’s Theorem?

What is Moody Diagram and its use in pipe flow?

What is boundary layer and write its types of thickness?

Distinguish between pipes in series and in parallel.

Enlist the advantages of dimensional analysis in fluid mechanics.

Give two examples of a fluid flow situation where Froude model law is applied.

PART B — (5 × 16 = 80 Marks)

Explain the surface tension and capillarity property of fluid with neat

(i)

sketches.

A cubical block of 20 cm edge and weight 100 N is allowed to slide down

(ii)

a plane inclined at 30° to the horizontal on which there is thin film of oil of

viscosity 2.5 × 10–3 N-s/m. What terminal velocity will be attained by the

block if the fill thickness is 0.025 mm?

(8)

(8)

Or

(i)

Explain the continuum concept of system.

A and B. Pipe A contains carbon tetrachloride

gravity 1.594 under a pressure of 1.2

specific gravity 0.8 under a pressure of 1.2 kgf/cm2. The pipe A lies 2.5 m

above pipe B. Find the difference of pressure measured by mercury as

fluid filling “U” tube.

Derive an expression to find the distance of centre of pressure from free surface

of liquid of an inclined plane surface sub-merged in the liquid.(16)

(8) (ii)

A “U” tube d

having specific

kgf/cm2

and pipe B contains oil of

(8)

Or

The velocity potential function φ is given by an equation

φ = (−x y3 / 3) − x 2 + (x 3 y / 3) + y2

(i)

Find the velocity components in x and y directions.

Show that φ represents a possible case of flow.

(ii)

A venturimeter measures the flow in a 75 mm diameter pipe. The

difference of head between the entrance and the throat of the

venturimeter is measured by U-tube containing mercury, the space above

the mercury on each side being filled with water. What should be the

diameter of the throat of the venturimeter in order that the difference of

levels of mercury shall be 0.25 m when the quantity of water flowing in

the pipe is 630 litres/minute. Assume the discharge co-efficient as 0.97.

(16)

(16)

Or

Derive an expression for the velocity distribution for the viscous flow

through a circular pipe. Also sketch the velocity distribution and shear stress

distribution across a section of the pipe.

(16)