C 61569 (Pages : 3) Name .....

Reg. No. .....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION
APRIL 2014

(2009 Scheme)

CE 09 403 / PT CE 09 402—FLUID MECHANICS

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

1. State Pascal's law.
2. Define velocity potential function.
3. What is a forced vertex flow.
4. What is meant by cavitation in pipes ?
5. State Froude's model law.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*
Each question carries 5 *marks.*

6. Define centre of buoyancy and meta centre.
7. A stream function is given by $\psi = 3x^2 - y^3$. Determine the magnitude of velocity at point (2, 1)
8. Describe different types of notches.
9. What is venturimeter ?
10. Differentiate between hydraulic gradient line and total energy line.
11. What are the merits and limitations of distorted models ?

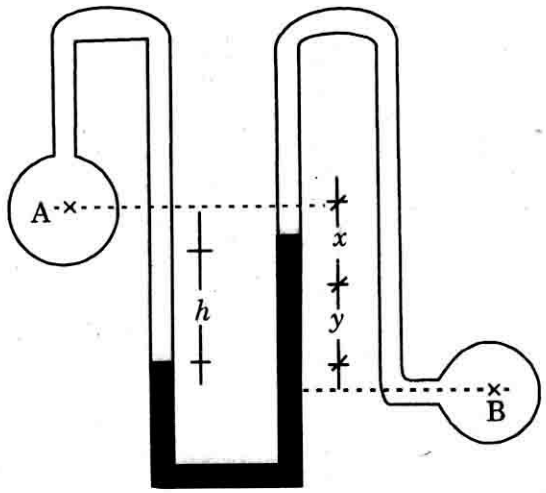
(4 × 5 = 20 marks)

Turn over

Part C

Answer **all** *questions.*
Each question carries 10 *marks.*

12. (a) (i) Vessels A and B contains water under pressures of 274.68 KN/m^2. and 137.34 KN/m^2 respectively. What is the deflection of mercury in the differential gauge shown in figure.



(ii) Define centre of buoyancy and metacentric height :

Or

(b) (i) A rectangular plane surface 1 m. wide and 3 m. deep lies in such a way that the plane of the plate makes an angle of 30° with the free surface of water. Determine the total pressure and position of centre of pressure when the upper edge of the plate is 2 m. below the free water surface

(ii) Explain different types of fluid flow :

13. (a) (i) Derive Euler's equations of motion.

(ii) A pipe line carrying oil of specific gravity 0.87 changes in diameter from 200 mm. diameter at a position A to 500 mm. diameter at a position B which is 4m at a higher level. If the pressures at A and B are 9.8 N/cm^2. and 5.886 N/cm^2. respectively and the discharge is 200 1itres/s determine the loss of head and direction of flow

Or

(b) 250 litres/s of water is flowing in a pipe having a diameter of 300 mm. if the pipe is bend by 135°, find the magnitude and the direction of resultant force on the bend. The pressure of water flowing is 39.24 N/cm^2.

14. (a) Three pipes of 400 mm, 200 mm and 300 mm diameters have lengths of 400 m, 200 m and 300 m respectively. They have connected in series to make a compound pipe. The ends of the compound pipe are connected with two tanks whose difference of water level is 16 m. if the coefficient of friction for the pipe is same and equal to 0.005, determine the discharge through the pipe neglect first the minor losses and then including them

Or

(b) Water flows from a reservoir through a pipe of 0.15 m. diameter and 18 cm. long to point 13.5 m. below the open surface of the reservoir. Here it branches into two pipes each of 0.1 m. diameter, one of which is 48m long discharging to atmosphere at a point 18 m. below reservoir level and the other 60 m. long discharging into atmosphere 24 m below the reservoir level. Assuming a constant coefficient of friction $4f = 0.032$. Calculate the discharge from each pipe. Neglect any losses at the junction.

15. (a) (i) Explain the characteristics of laminar and turbulent boundary layer

(ii) A spillway 7.2 m. high and 150 m. long discharges 2150 m^3/s under ahead of 4 m. If a 1:16 model of the spillway is to be constructed, find the model dimensions, head over the model and model discharge.

Or

(b) (i) State Reynold's model law :

(ii) For laminar flow in a pipe, the drop in pressure ΔP is a function of pipe length L, it's diameter d, mean velocity V and viscosity of fluid μ. Derive the expression for ΔP using Buckingham's π theorem

(4 × 10 = 40 marks)