KATHMANDU UNIVERSITY
End Semester Examination
August/September, 2017

SEP 13 2017

Level : B.E.
Year : II
Time : 2 hrs. 30 mins.

Course : CHEG 212
Semester : II
F. M. : 40

SECTION "B"

Attempt *ALL* the questions and mention assumptions to the numerical problem wherever necessary.

1. a) List down at least four dimensionless parameter encountered in fluid mechanics and write expression of each. [2]
   b) The Melamchi water project uses pipe of diameter 'D' and length 'L'. The water flows with velocity 'v' whose viscosity is 'μ' and density 'ρ'. The roughness of the pipe is denoted as 'k'. Use Buckingham π – theorem to derive a relation for pressure difference 'ΔP' if it depends upon all the parameters mentioned above. [4]

2. Write the construction and working of Bourdon tube pressure gauge with neat diagram. [3]

3. Differentiate between (*ANY FOUR*): [4 × 2 = 8]
   a) Pseudoplastic and dilatant fluid based on shear thickening and thinning behavior with graphical diagram and example.
   b) Variable area meter and differential head meter
   c) Pathline and streakline
   d) Blower and compressor
   e) Thixotropic and rheopectic fluid

4. In the oil pipeline of Raxaul–Amlekhgunj, a horizontal venturimeter with inlet diameter 20 cm and throat diameter 10 cm is used to measure the flow of oil of specific gravity 0.8. The discharge of oil through venturimeter is 60 litre/sec. Find the reading of mercury differential manometer. Take coefficient of discharge = 0.98 [3]

5. Prove the parabolic nature of velocity distribution for a fluid flow in a horizontal cylindrical pipe of radius 'r' where fluid is flowing from left to right. [4]

6. In a petrochemical refining company, an oil of specific gravity 0.7 is flowing through a pipe of diameter 300 mm at the rate of 500 litre/sec. Find
   a) Head lost due to friction
   b) Power required to maintain the flow for a length of 1 km.
   (Take kinematic viscosity as 0.29 Stoke)

   OR

   A spherical steel ball of diameter 40 mm and of density 8500 kg/m^3 is dropped in a large mass of water. The coefficient of drag of the ball in water is given as 0.45. Find the terminal velocity of the ball in water. If the ball is dropped in air, find the increase in terminal velocity of ball. Take density of air as 1.25 kg/m^3 and C_d as 0.1. [4]

7. Explain boundary layer theorem in detail with diagram. [3]

8. What is cavitation in pump? Explain pump performance curve and system curve. [3]

9. Write the types of valve with one important feature of each. [3]

10. A differential manometer is connected at two point A and B of two pipes as shown in Fig.1. Pipe A contains oil of specific gravity = 0.98 and manometer consist of mercury whose specific gravity is 13.6. At B, there is a water–air interface where air pressure is 9.81 N/cm^2. Find the absolute pressure at A. [3]

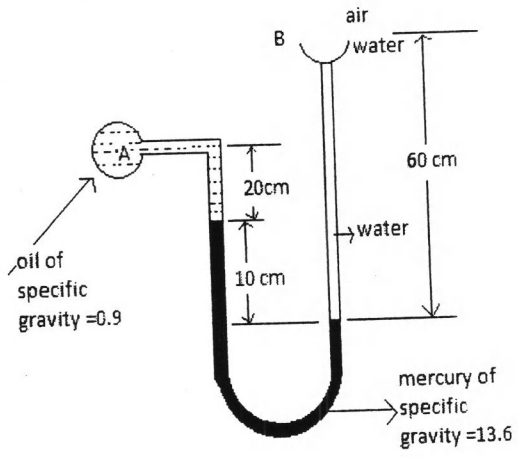

Fig.1 Differential manometer