

Registration No. :

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Total number of printed pages – 2

B. Tech
PCCH 4201

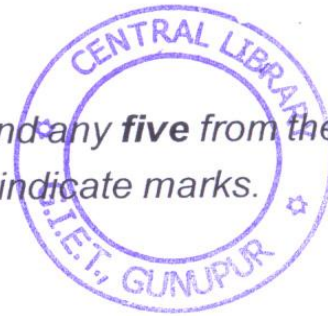
Third Semester Back Examination – 2014
FLUID FLOW AND FLOW MEASUREMENT
BRANCH : CHEM

QUESTION CODE : L 325

Full Marks – 70

Time : 3 Hours

Answer Question No. **1** which is compulsory and any **five** from the rest.
The figures in the right-hand margin indicate marks.



2 × 10

1. Answer the following questions :

- State the Buckingham's π -theorem.
- Mention the SI units of dynamic and kinematic viscosities.
- Calculate the pressure in N/m^2 corresponding to :
 - 6 m of water column and
 - 10 cm of mercury column.
- Define wall and free turbulence.
- What are skin and form friction ?
- Define friction factor. Mention its importance.
- Write Stoke's law.
- Write the chief advantages of fluidization.
- What is cavitation in a pump ? How can cavitation be avoided ?
- What is slip in a reciprocating pump ?

2. (a) Check the dimensional consistency of the following empirical equation for a heat-transfer coefficient : 5

$$h_i = 0.023 G^{0.8} k^{0.67} C_p^{0.33} D^{-0.2} \mu^{-0.47}$$

where h_i = heat transfer coefficient

G = mass velocity

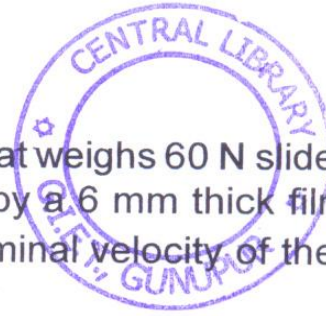
P.T.O.

k = thermal conductivity

C_p = specific heat

D = diameter

μ = absolute viscosity.



- (b) Derive the Barometric equation. 5
3. (a) A rectangular solid block of 2 m by 2 m that weighs 60 N slides down a 30° inclined plane. The plane is lubricated by a 6 mm thick film of an oil of viscosity 0.04 N.s/m^2 . Calculate the terminal velocity of the block in the downward direction on the inclined plane. 6
- (b) A differential U-tube manometer is used to measure the pressure difference between points 1 and 2 in a pipeline carrying a liquid of density 990 kg/m^3 . The point 2 is 0.5 m higher than point 1. The difference in level of mercury in the two limbs is 0.8 m. Calculate the pressure difference between points 1 and 2. 4
4. Derive the point form of the Bernoulli equation without friction for the steady flow of a fluid in potential flow with a neat figure. 10
5. A venturimeter is used for the measurement of discharge of water in a horizontal pipeline. The pipe diameter is 20 cm and the throat diameter is 12 cm. When a flow of 130 lit/s is flowing, the attached manometer shows a head difference of 50 cm if the coefficient of discharge of the venturimeter is 0.98, find the density of the manometric fluid in the manometer. 10
6. Discuss in detail the conditions, types, and applications of fluidization. 10
7. Discuss in detail the construction and working of a reciprocating pump with a neat diagram. Also mention in brief the types of reciprocating pumps. 10
8. Write short notes on any **two** : 5×2
- (a) Newtonian and non-Newtonian fluids
 - (b) Boundary layer formation in straight tubes
 - (c) Rotameter
 - (d) Centrifugal pump.