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SARDAR PATEL UNIVERSITY
EXTERNAL EXAMINATION, OCTOBER 2016
M.Sc INDUSTRIAL CHEMISTRY-SEMESTER 3
PS03CICH 08:Process Safety Management and transportation of fluids

Date:25th Oct,2016   Total marks:70
Time:2.00 p.m-5.00 p.m

Answer all the questions.   Figures to the right indicate marks.

Q1. Write the number of the correct statement (8 *1 =8 marks)

   a. At high Reynolds number,---------
i.Viscous forces predominate   iii.Inertial forces predominate
ii.Gravitry forces predominate   iv.Both viscous and gravity forces predominate

   b. The ratio of inertial force to viscous force is called
    i.Viscosity   ii.Surface tension   iii.Newtons number   iv.Reynolds number

   c. The friction factor for turbulent flow in a hydraulically smooth pipe -----
   i. Depends only on Reynolds number   iii.Does not depend on Reynolds number
   ii.Depends on roughness   iv.None of these

   d. For terminating a pipeline,------ is used.

    i.coupling   ii.elbow   iii.plug   iv.valve

   e. The head (H)of a centrifugal pump depends on the rpm of the impeller(N) according to the relation

    i.$H \propto N^2$ ii. $H \propto N$ iii.ii. $H \propto N^3$ iv. $H \propto N^5$

   f. For getting uniform discharge in a reciprocating pump,----- is used
    i. foot valve   ii.air vessel   iii.needle valve   iv.gate valve

   g. NPSH of a centrifugal pump must be ------
    i. >1   ii. <1   iii.1   iv. 0.7

   h. LD_{50} of potassium cyanide is ------
    i.less than 15   iii. More than 25 and less than 50
    iii.more than 50   iv. None of these

Q2. Answer any Seven (7 * 2 =14 marks)

   a. Define Power number and NRe power
   b. Define fanning friction factor
   c. Write the principle of fluidization
   d. Write Hagen-poiseulle equation and enlist any 2 applications
   e. Define the various regions of flow when solid particles settle through fluids

f. Distinguish between free and hindered settling
g. Define TLV and IDHL
h. Distinguish between LFL and UFL
i. Define material factor in Dow F & EI Index

Q3.

a. A reciprocating pump has a piston of dia 0.12 m and stroke of length 0.3 m.The pump center is 4 m above the sump level and 30 m below the delivery level.The diameter of suction pipe is 0.068 m and that of delivery pipe is 0.05 m.If the pump works at 60 rpm and has a mechanical efficiency of 80 %, find the horse power required to drive the pump. **(06)**

b. A centrifugal pump delivers 0.03 m^3/s of water to a height of 18 m through a pipe 90 m long and 0.1 m diameter. If the efficiency of the pump is 75 % and if the friction factor is 0.012, find the horse power required to drive the pump. **(06)**

OR

b. A single acting reciprocating pump having a piston of dia 0.15 m and stroke of length 0.3 m discharges 0.2 m^3/s of water at 40 rpm. Calculate the co-efficient of discharge and % slip of the pump. **(06)**

Q4.

a. Prove that the velocity profile over a pipe section is parabolic in shape. **(06)**
b. With the help of neat sketches, distinguish between propeller, turbine and paddles. **(06)**

OR

b. Derive the equation for terminal settling velocity of a spherical particle moving through a fluid under the action of centrifugal force in the Newton's flow range.**(06)**

Q5.

a. Particles of density 7500 kg/m^3 and dia 0.00025 m are to be settled from their mixture with water of density 1000 kg/m^3 and viscosity 0.001 kg/m sec.If a settling time of 60 sec is available, what should be the height of the settling chamber? Use g = 9.81 m/sec^2 **(06)**
b. Distinguish between dilution ventilation and local exhaust ventilation **(06)**

OR

b. Describe in detail, HAZOP **(06)**

Q6.

a. Write a note on hot work permit and mechanical integrity as applied to process safety management **(06)**
b. With an example, explain fault tree analysis **(06)**

OR

b.Write the various steps involved in the calculation of DOW F & EI Index **(06)**

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