

Day: Saturday
Date: 25/05/2019

S-2019-2592

Time: 10.00 AM TO 01.00 PM
Max. Marks: 60

N.B:

- 1) All questions are **COMPULSORY**.
 - 2) Figures to the right indicate **FULL** marks.
 - 3) Assume suitable data if necessary.
 - 4) Use of non programmable **CALCULATOR** is allowed.
-

- Q.1** a) Derive an expression for vertical single column manometer (06)
(micromanometer) with neat labeled diagram.
- b) The left limb of a U-tube mercury manometer is connected to a pipe line (04)
conveying water. The level of mercury in the left limb is 0.6 m below the
centre of pipe line and the right limb is open to the atmosphere. The level of
mercury in right limb is 0.45 m above that in the left limb and the space
above mercury in the right limb contains benzene (specific gravity 0.88) to a
height of 0.3 m. Find pressure in the pipe.

OR

- Q.1** a) State and prove Pascal's law by considering a wedge shaped element of (06)
fluid.
- b) A cylindrical body 180 mm diameter and 160 mm long has 25 N weight. It (04)
slides down a cylindrical tube of 181mm diameter. The gap between the tube
and the body is filled with oil of kinematic viscosity 2.716 stokes. If density
of oil is 810 kg/m^3 , calculate the velocity of the body.
- Q.2** a) State and derive Bernoulli's equation along a stream line. Also write its (06)
assumptions and limitations.
- b) A 40 cm diameter pipe, conveying water, branches into two pipes of (04)
diameters 30 cm and 20 cm respectively. If the average velocity in the 40 cm
diameter pipe is 3 m/s. Find the discharge in this pipe. Also determine the
velocity in 20 cm pipe if the average velocity in 30 cm diameter pipe is 2m/s.

OR

- Q.2** a) Derive an expression for the shear stress distribution in fully developed (06)
laminar flow in circular pipe. Also sketch the shear stress distribution and
velocity distribution across the section of pipe.
- b) An oil viscosity 0.1 Ns/m^2 and specific gravity 0.9 is flowing through a (04)
circular pipe of diameter 50 mm and of length 300 m. The rate of flow of
fluid through the pipe is 3.5 litres/sec. Find the pressure drop in a length of
length 300 m and also the shear stress at the pipe wall.

P.T.O.

- Q.3** a) Derive equation for orificemeter with neat labeled diagram. Also write the various cases to calculate value of difference of pressure head (h). (06)
- b) A horizontal venturimeter with inlet diameter 20 cm and throat diameter 10 cm is used to measure the flow of water. The pressure at inlet is 17.658 N/cm^2 and the vacuum pressure at the throat is 30 cm of mercury. Find the discharge of water through venturimeter. Take coefficient of venturimeter as 0.98. (04)

OR

- Q.3** a) Explain Pitot tube with neat labeled diagram. (06)
- b) Explain in detail the velocity distribution for turbulent flow in smooth pipe and rough pipe. (04)
- Q.4** Derive Darcy-Weisbach equation for loss of head due to friction for fluid flowing through a pipe. (10)

OR

- Q.4** a) Derive equation for loss of head due to sudden contraction of pipe for fluid flowing through a pipe. (06)
- b) Explain various types of major and minor losses takes place in pipe when fluid flowing through a pipe. (04)
- Q.5** A pump draws a solution of specific gravity 1.84 from a storage tank of large section through a 8 cm inner diameter (ID) pipe. The velocity in the suction pipe is 1 m/s. The pump discharge through 5 cm ID pipe to an overhead tank. The end of discharge line is 15 m above the level of solution in the tank. Friction losses in the entire system may be taken as 3 m of solution. What is the theoretical horsepower (hp) required to do this pumping? (10)

OR

- Q.5** a) Explain in detail Cavitation and NPSH of centrifugal pump. (06)
- b) Write a short note on blowers. (04)
- Q.6** a) Explain the concept of fluidization with a graph of pressure drop and bed height V/s superficial velocity for a bed of solids. (06)
- b) Write applications of fluidization. (04)

OR

- Q.6** Write a note on (ANY TWO): (10)
- a) Types of fluidization
- b) Laminar and turbulent flow in boundary layer
- c) Minimum fluidization velocity

* * * * *