B.E/B.TECH. Degree Examination, December 2020

Third Semester

CH16304-Fluid Mechanics

(Regulation 2016)

Time: Three hours Maximum : 80 Marks

Answer **ALL** questions

PART A - (8 X 2 = 16 marks)

1. Calculate the density of the fluid, if the specific gravity of a fluid is 0.7.
   (a) 713 kg/m^3
   (b) 700 kg/m^3
   (c) 686 kg/m^3
   (d) 70 kg/m^3
2. At what fluid condition, the normal stress is considered as the pressure force and is same in all directions at a point in a fluid.
   (a) incompressible
   (b) non-viscous
   (c) motion
   (d) static
3. The equation corresponding with viscous and kinetic energy losses in a packed bed
   (a) Burke-Plummer equation
   (b) Hagen-poiseuille equation
   (c) Ergun equation
   (d) Kozeny karman equation
4. Match the following -In practice it is common to differentiate

A.	Compressor	-	(i)	raising a liquid to a higher level of pressure
B.	Pumps	-	(ii)	moving volume of a gas with moderate increase of pressure
C.	Blowers	-	(iii)	moves large amount of gas with low increase in pressure
D.	Fans	-	(iv)	raising a gas to a higher level of pressure

   (a) A (ii), B (i), C (iv) and D (iii)
   (b) A (i), B (iv), C (iii) and D (ii)
   (c) A (iv), B (i), C (ii) and D (iii)
   (d) A (iii), B (iv), C (i) and D (ii)
5. Differentiate compressible and incompressible fluid.
6. Rationalize the desired properties of liquid necessary for it to be used in manometer.
7. State the physical significance of Reynolds number.
8. Differentiate centrifugal pump and reciprocating pump.

PART B - (4 X16 = 64 marks)

09. (a) (i) The velocity distribution for a flow over a flat plate is given by **(8)**

$u = (3/4)y - y^2$

where,

u = velocity (m/s)

y = distance above the plate (m)

Determine shear stress at y = 0.15 m. Take dynamic viscosity of the fluid as 8.6 Poise.

(ii) Differentiate steady state and unsteady state flow with examples **(8)**

(OR)

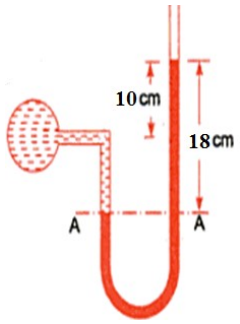
(b) (i) With a neat sketch rheological diagram and explain the behavior of Newtonian fluid and non-Newtonian fluids. **(12)**

(ii) Two horizontal plates are placed 1.25 cm apart, the space between them filled with oil of viscosity 14 poises. Calculate the shear stress in oil if the upper plate is moved with the velocity of 2.5 m/s. **(4)**

10. (a) Derive the full form of Bernoulli equation with fluid friction and pump work for the flow of an incompressible fluid. **(16)**

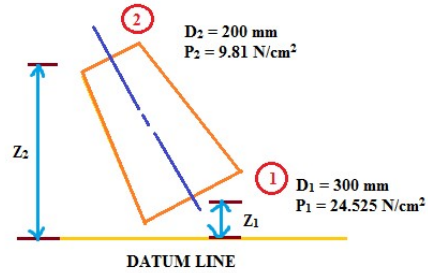
(OR)

(b) (i) The right limb of a U-tube manometer containing mercury is open to the atmosphere while the left limb is connected to a pipe in which a fluid of specific gravity 0.8 is flowing. The centre of the pipe is 10 cm below the level of mercury in the right limb. Find the pressure of fluid in the pipe if the difference of mercury in the two limbs is 18 cm. **(8)**



(ii) Water is flowing through a pipe having diameter 300 mm and 200 mm at bottom and upper end respectively. The intensity of pressure at the bottom end **(8)**

is 24.525 N/cm^2 and the pressure at the upper end is 9.81 N/cm^2. Determine the difference in datum head if the rate of flow through pipe is 40 litres/s.



11. (a) (i) With a neat sketch, derive the shear stress distribution in a cylindrical tube. **(12)**

(ii) List out various minor losses that are encountered in pipe systems. **(4)**

(OR)

(b) Derive the expression of Ergun's equation flow through the packed bed. **(16)**

12. (a) (i) The inlet and throat diameters of a horizontal venturimeter are 30 cm and 10 cm respectively. The liquid floating through the meter is water. Pressure intensity at the meter is 13.734 N/cm^2, while the vacuum pressure head at the throat is 37 cm of mercury. Find the rate of flow. Assume that 4% of the differential head is lost between the inlet and throat. Find the value of C_d. **(12)**

(ii) What are the factors influencing selection of pump in industrial application? **(4)**

(OR)

(b) Briefly describe the theory of centrifugal pump and analyze the characteristics curves of a centrifugal pump for smooth and efficient operation. **(16)**