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**Question Paper Code: 53903**

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2019

Third Semester

Chemical Engineering

15UCH303 - FLUID MECHANICS FOR CHEMICAL ENGINEERING

(Regulation 2015)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. A small shear force is applied on an element and then removed. If the element regains its original position, what kind of an element can it be? CO1- R  
(a) Solid                      (b) Liquid                      (c) Fluid                      (d) Gaseous
2. Which of the following is a shear-thinning fluid? CO1- R  
(a) Bingham plastic      (b) Rheopectic              (c) Dilatant                      (d) Pseudoplastic
3. Which of the following cannot be the value of absolute pressure of a fluid at any point? CO2- R  
(a) 1.013 bar              (b) 0                              (c) -1 bar                      (d) 200 bar
4. Navier- Stokes equation describes the motion of \_\_\_\_\_ CO2- R  
(a) Solid substance      (b) Non-viscous fluid      (c) Viscous fluid              (d) Gas
5. The fundamental dimensional quantities are related by \_\_\_\_\_ CO3- R  
(a) Avagadaro's law                      (b) Newton's second law  
(c) Newton's first law                      (d) Newton's third law
6. Similitude is a concept applicable to the testing of \_\_\_\_\_ CO3- R  
(a) Mathematical models                      (b) Physical model  
(c) Chemical models                      (d) Engineering models

7. Fluid flow at increasing rate through a diverging pipe is an example of \_\_\_ flow. CO4- R  
 (a) Steady non - uniform (b) Non steady non uniform  
 (c) Steady uniform (d) Non steady uniform
8. Which of the factors primarily decide whether the flow in a circular pipe is laminar or turbulent? CO4- R  
 (a) The Reynolds Number (b) The Prandtl Number  
 (c) The Pressure gradient along the length of the pipe (d) All of the above
9. In venturi meter, the converging cone angle is of the order of \_\_\_ degree. CO5- R  
 (a) 5-7 (b) 7-10 (c) 15-20 (d) 20-25
10. The need for priming is eliminated by providing CO5- R  
 (a) Negative suction head (b) Positive suction head  
 (c) Positive discharge head (d) Negative discharge head

PART – B (5 x 2= 10 Marks)

11. What is meant by continuum? CO1- R
12. State Bernoulli's theorem. CO2- R
13. Define Dimensional Homogeneity. CO3- R
14. Define Drag Force and Drag coefficient. CO4- R
15. What is meant by blind flange? CO5- R

PART – C (5 x 16= 80 Marks)

16. (a) (i) Explain briefly about the types of fluid flow. CO1- U (8)  
 (ii) A liquid with kinematic viscosity of 4 centistokes and specific weight  $8000\text{N/m}^3$  fills the space between a large stationary plate and parallel plate of  $550\text{mm}^2$ , which are kept 2mm apart. If a parallel plate is to be pulled with uniform of 3m/sec. Determine the force and power required to maintain the speed. CO1- App (8)

Or

- (b) Explain in detail about the classification of fluid types of fluid motion. CO1 App (16)

17. (a) (i) Explain briefly about the fluid friction. CO2- U (8)  
(ii) Explain the effect of roughness. CO2- U (8)
- Or
- (b) Derive Navier-stokes equations. CO2- U (16)
18. (a) The pressure difference  $\Delta P$  in a pipe of diameter  $D$  and length  $l$  due to viscous flow depends on the velocity  $v$ , viscosity  $\mu$  and density  $\rho$ . using Buckingham's pi-theorem obtain an expression for  $\Delta P$ . CO3- Ana (16)
- Or
- (b) (i) Explain similitude and types of similarities. CO3- Ana (8)  
(ii) Pipe of diameter 1.8m is required to transport an oil of specific gravity 0.8 and viscosity 0.04 poise at the rate of  $4\text{m}^3/\text{s}$ . Tests were conducted on a 20cm diameter pipe using water at  $20^\circ\text{C}$ . Find the velocity and rate of flow in model, viscosity of water at  $20^\circ\text{C}$  is 0.01 poise. CO3- Ana (8)
19. (a) Find the diameter of a particle of specific gravity 2.65 which will have a terminal velocity of 0.5 m/s in water. CO4- U (16)  
Take  $\mu_w = 10^{-3}$  kg m/ s. Assume  $N_{Re,P} = 100$ . Find the diameter of a particle of specific gravity 2.65 which will have a terminal velocity of 0.5 m/s in water. Take  $\mu_w = 10^{-3}$  kg m/ s.  
Assume  $N_{Re,P} = 100$ .
- Or
- (b) (i) Explain briefly about the Fluidization and their advantages and disadvantages. CO4- U (8)  
(ii) Derive the terminal settling velocity of spherical particle in a fluid medium. CO4- U (8)
20. (a) Explain with neat sketch about the working of Reciprocating pump with its discharge curves. CO5 U (16)
- Or
- (b) (i) An oil of specific gravity 0.9 is flowing through a venturimeter having inlet diameter 20cm and throat diameter 10cm. The oil- mercury differential manometer shows a reading of 20cm. Calculate the discharge of oil through the horizontal venturimeter. Take  $C_d=0.98$ . CO5- U (8)  
(ii) Differentiate Variable head meters and Variable area meters. CO5- U (8)

