Register Number:……..

KUMARAGURU college of technology
character is life

**B.E/B.TECH DEGREE EXAMINATIONS: APRIL /MAY 2024**

(Regulation 2018)

Fourth Semester

**AUTOMOBILE ENGINEERING**

U18AUI4202 **:** Fluid Mechanics and Machinery

**COURSE OUTCOMES**

CO1: Understand the properties of the fluid, flow concepts and measuring devices.

CO2: Apply the fluid flow concepts and solve the problems.

CO3: Analyse the practical flow problems using mathematical techniques.

CO4: Apply the laws of conservation in flow through pipes.

CO5: Illustrate the working principles of hydraulic machines.

**Time: Three Hours** **Maximum Marks: 100**

**Answer all the Questions:-**

**PART A (10 x 2 = 20 Marks)**

**(Answer not more than 40 words)**

| | | | |
|---|---|---|---|
| 1. | State Newton's law of viscosity | CO1 | [K2] |
| 2. | Briefly explain the phenomenon surface tension | CO1 | [$K_2$] |
| 3. | Enlist the practical applications of Bernoulli's equation | CO2 | [$K_1$] |
| 4. | Differentiate between steady and unsteady fluid flow | CO2 | [$K_4$] |
| 5. | Define dimensional homogeneity | CO3 | [$K_1$] |
| 6. | State Buckingham's π theorem | CO3 | [$K_2$] |
| 7. | Enlist the minor energy losses in a fluid flow | CO4 | [$K_1$] |
| 8. | Write Chezy's equation for frictional losses and list all the terms involved in it. | CO4 | [$K_2$] |
| 9. | Differentiate between impulse turbines and reaction turbines | CO5 | [$K_4$] |
| 10. | Explain the phenomenon of Cavitation in centrifugal pumps | CO5 | [$K_2$] |

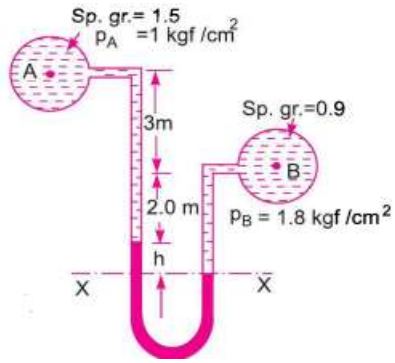
**Answer any FIVE Questions:-**

**PART B (5 x 16 = 80 Marks)**

**(Answer not more than 400 words)**

| | | | | | |
|---|---|---|---|---|---|
| 11. | a) | Explain capillarity in detail and derive the expressions for capillary rise and capillary fall with neat diagrams. | 8 | CO1 | [$K_2$] |
| | b) | State and prove Pascal's law. | 8 | CO1 | [$K_2$] |

| | | | | | |
|---|---|---|---|---|---|
| 12. | a) | Derive the Euler's equation of motion and deduce the expression to Bernoulli's equation. | 8 | CO2 | [$K_3$] |
| | b) | The inlet and throat diameters of a horizontal venturimeter are 30 cm and 10 cm respectively. The liquid flowing through the meter is water. The pressure intensity at inlet is 13.731 N/cm$^2$ while the vacuum pressure head at 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. Also find the value of $C_d$ for the venturimeter. | 8 | CO2 | [$K_3$] |
| 13. | | 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 $\Delta p$ | 16 | CO3 | [$K_3$] |
| 14. | a) | Derive Darcy-Weisbach equation and state its practical importance in fluid flow | 8 | CO4 | [$K_3$] |
| | b) | The difference in water surface levels in two tanks, which are connected by three pipes in series of length 300m, 170m and 210m and of diameters 300mm, 200mm and 400mm respectively, is 12m. Determine the rate of flow of water if coefficient of friction are 0.005, 0.0052 and 0.0048 respectively considering i) minor losses also ii) neglecting minor losses | 8 | CO4 | [$K_3$] |
| 15. | a) | Explain the construction and working of a Pelton wheel with neat sketch. | 10 | CO5 | [$K_2$] |
| | b) | Draw and explain the various characteristic curves of centrifugal pump | 6 | CO5 | [$K_2$] |
| 16. | a) | State hydrostatic law and derive the expression for pressure intensity at a point inside a fluid at rest. | 8 | CO1 | [$K_2$] |
| | b) | A differential manometer is connected at two points A & B of two pipes as shown in figure below. The pipe A contains a liquid of sp. Gravity 1.5 while pipe B contains a liquid with sp. Gravity 0.9. The pressure at A & B are 1 kgf/cm$^2$ and 1.8 kgf/cm$^2$ respectively. Find the difference in mercury level in the manometer | 8 | CO1 | [$K_3$] |

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