JHARKHAND UNIVERSITY OF TECHNOLOGY

Diploma 3rd Semester Sample Paper (DIPLOMA WALLAH)

FLUID POWER ENGINEERING (MEC 304)

Time: 3 Hours **Full Marks: 70** **SET: 1**

INSTRUCTIONS:

1. Question No. 1 is Compulsory.
2. Answer any **FOUR** questions from the remaining (Q.2 to Q.7).
3. Use the provided figures for numerical problems.

Q.1. Multiple Choice Questions [2 × 7 = 14]

(i) The viscosity of a liquid varies with temperature. As temperature increases, viscosity:

(a) Increases (b) Decreases
(c) Remains same (d) First increases then decreases

(ii) The pressure intensity at a point in a static fluid is equal in all directions. This is:

(a) Archimedes' Principle (b) Pascal's Law
(c) Bernoulli's Principle (d) Newton's Law

(iii) Manometers are used to measure:

(a) Velocity (b) Discharge
(c) Fluid Pressure (d) Density

(iv) Which of the following is an Impulse Turbine?

(a) Francis Turbine (b) Kaplan Turbine
(c) Pelton Wheel (d) Propeller Turbine

(v) Priming is primarily required in:

(a) Reciprocating Pump (b) Centrifugal Pump
(c) Gear Pump (d) Hydraulic Ram

(vi) The theoretical discharge of a single-acting reciprocating pump is:

(a) ALN/60 (b) 2ALN/60
(c) ALN/120 (d) ALN

(vii) Bernoulli's equation is based on conservation of:

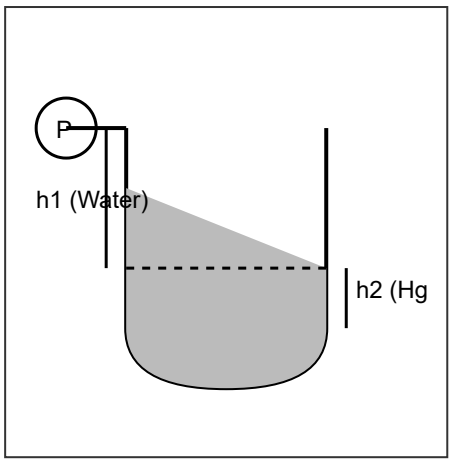
(a) Mass (b) Momentum
(c) Energy (d) Force

SECTION B (Long Answer Type)

Q.2. (a) [Theory] Define **Viscosity**. State **Newton's Law of Viscosity**. Differentiate between Newtonian and Non-Newtonian fluids with examples. [7]

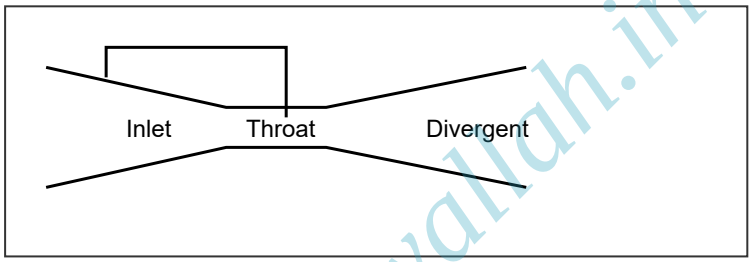
Q.2. (b) [Numerical] A **Simple U-Tube Manometer** is used to measure pressure of water in a pipe. The right limb contains Mercury (S.G = 13.6). If $h_2 = 10$ cm and $h_1 = 20$ cm, find the **Pressure in the**

pipe. [7]



Q.3. (a) [Theory] State and prove **Bernoulli's Theorem** for the flow of an ideal incompressible fluid. Mention the assumptions made. [7]

Q.3. (b) [Theory/Diagram] Explain the working of a **Venturimeter** with a neat sketch. Derive the expression for discharge through it. [7]



Q.4. (a) [Theory] Explain the construction and working of a **Pelton Wheel Turbine**. Why is it called a High Head Turbine? [7]

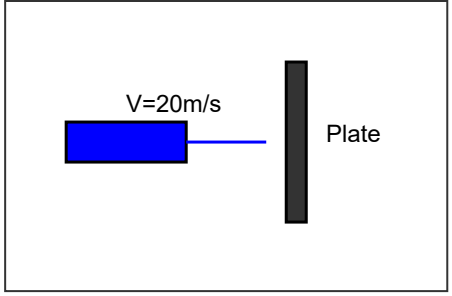
Q.4. (b) [Theory] Define **Specific Speed** of a turbine. Differentiate between Impulse and Reaction Turbines based on pressure drop. [7]

Q.5. (a) [Theory] Explain the working of a **Centrifugal Pump** with a neat diagram. What is the function of the Volute Casing? [7]

Q.5. (b) [Theory] What is **Priming**? Why is it necessary in centrifugal pumps but not in reciprocating pumps? [7]

Q.6. (a) [Theory] Explain the working of a **Hydraulic Press** with a schematic diagram. State Pascal's Law application here. [7]

Q.6. (b) [Numerical] A jet of water of diameter 50 mm moving with a velocity of 20 m/s strikes a **fixed vertical plate**. Find the Force exerted by the jet. [7]



Q.7. Write Short Notes on (Any FOUR): **[3.5 × 4 = 14]**

a. Surface Tension & Capillarity

b. Draft Tube

c. Slip in Reciprocating Pump

d. Cavitation

e. Hydraulic Accumulator

Diploma Wallah: Solution Key

MCQ: (i) b, (ii) b, (iii) c, (iv) c, (v) b, (vi) a, (vii) c.

Q2(b) Hint: $P + \rho_1 g h_1 = \rho_2 g h_2$. $P + (1000 \times 9.81 \times 0.2) = (13600 \times 9.81 \times 0.1)$. $P = 11.38$ kPa.

Q6(b) Hint: Force $F = \rho a V^2$. $a = \pi/4(0.05)^2$. $F = 1000 \times 0.00196 \times 400 = 785$ N.
