JHARKHAND UNIVERSITY OF TECHNOLOGY

Diploma 3rd Semester Sample Paper (DIPLOMA WALLAH)

FLUID POWER ENGINEERING (MEC 304)

Time: 3 Hours **Full Marks: 70** **SET: 2**

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) Atmospheric pressure at sea level is approximately:

(a) 10.3 m of water
(b) 760 mm of mercury
(c) 101.3 kN/m²
(d) All of the above

(ii) The coefficient of discharge (Cd) for a Venturimeter is around:

(a) 0.6 to 0.7
(b) 0.95 to 0.98
(c) 1.0 to 1.2
(d) 0.5 to 0.6

(iii) In a Centrifugal pump, the liquid enters the impeller:

(a) At the center (Eye)
(b) At the top
(c) At the bottom
(d) Tangentially

(iv) Kaplan Turbine is a:

(a) Tangential flow turbine
(b) Radial flow turbine
(c) Axial flow turbine
(d) Mixed flow turbine

(v) An Air Vessel is used in a Reciprocating pump to:

(a) Increase delivery head
(b) Obtain continuous supply
(c) Reduce suction head
(d) Increase efficiency

(vi) Continuity Equation ($A_1V_1 = A_2V_2$) represents conservation of:

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

(vii) The unit of Surface Tension is:

(a) N/m²
(b) N/m
(c) N-m
(d) kg/m

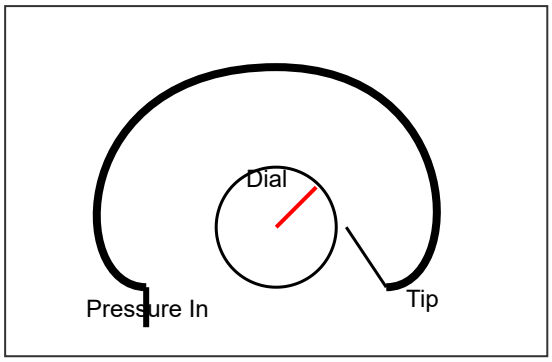
SECTION B (Long Answer Type)

Q.2. (a) [Theory] Derive the **Continuity Equation** for 3D flow in Cartesian coordinates. Reduce it for one-dimensional steady incompressible flow ($A_1V_1 = A_2V_2$). **[7]**

Q.2. (b) [Numerical] A pipe of diameter 300 mm branches into two pipes of diameters 200 mm and 150 mm. If the average velocity in the 300 mm pipe is 2.5 m/s, find the **Discharge in the main pipe**

and **Velocity in the 150 mm pipe** (assuming equal discharge in branches). **[7]**

Q.3. (a) [Theory/Diagram] Explain the working of **Bourdon's Tube Pressure Gauge** with a neat sketch. What is it used for? **[7]**



Q.3. (b) [Theory] What is a **Piezometer**? What are its limitations compared to U-tube Manometers? **[7]**

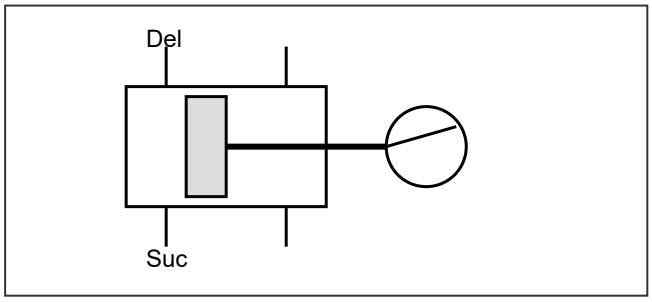
Q.4. (a) [Theory] Explain the construction and working of a **Francis Turbine**. Draw the velocity triangles at inlet and outlet. **[7]**

Q.4. (b) [Theory] Explain the function of a **Draft Tube**. Why is it used in Reaction Turbines? List two types of draft tubes. **[7]**

Q.5. (a) [Theory] Differentiate between **Centrifugal Pump** and **Reciprocating Pump** (at least 7 points). **[7]**

Q.5. (b) [Theory] Derive the expression for the **Work Done** by the impeller of a centrifugal pump on water per second per unit weight. **[7]**

Q.6. (a) [Theory/Diagram] Explain the working of a **Double Acting Reciprocating Pump** with a neat diagram. Define Slip and Negative Slip. **[7]**



Q.6. (b) [Theory] What is an **Indicator Diagram**? Draw the theoretical and actual indicator diagrams for a reciprocating pump showing the effect of acceleration head. **[7]**

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

a. Hydraulic Gradient Line (HGL)

b. Pitot Tube

c. Governing of Turbines

d. Hydraulic Ram

e. Gauge Pressure vs Absolute Pressure

Diploma Wallah: Solution Key

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

Q2(b) Hint: Q_main = A_1V_1. Q_branch = Q_main / 2. Then use Q_branch = A_3V_3 to find V_3.

Q5(b) Formula: Work Done = (1/g) * [V_w2 * u_2].
