Section-3

Ans-1 Jet Ratio

(i) It is defined as ratio of the pitch diameter (D) of the pelton wheel to diameter of the Jet (D).

(ii) It is denoted by m

(iii) It is given by the formula :
$$m = \frac{D}{d}$$

(iv) Generally the value of m is 12 for most cases to maintain the balance.

Hydralic Jump :

(i) The hydraulic jump is defined as the sudden and turbulent passages of water from a supercritical state to subcritical state. It has been classified as rapidly varied flow, since the changes in depth of flow from rapid to tranquil state in an abrupt manner over a relatively short distance.

(ii) The flow in a hydraulic jump is accompained by the formation of extremly turbulent rollers and there is a considerable dissipation of energy.

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(iii) A hydraulic jump will form when water moving at a supercritical velocity in a relatively shallow strem strikes water having a relatively large depth and subcritical velocity.

(iv) It occurs frequently in a cannal below a regulating sluice, at the foot of a spillway, or at the place where a steep channel bottom slope suddenly changes to a flat slope.

Integral moment is used to analyze hydraulic jump.

Use of Momentum Equation:

(i) Due to high turbulence and shear action of the roller, there is considerable loss of energy in the jump between sections 1 and 2.

(ii) In view of the high energy loss, the nature of which is difficult to estimate the energy equation cannot be applied to sections 1 and 2 to relate the various flow parameters.

(iii) In such situations, we use momentum equation in analysis of hydraulic jump.

Expression:

(i) Considered a horizontal, frictionless and rectangular channel. Considering unit width of the channel, the

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momentum equation can be written as

$$\frac{1}{2}\gamma y_1^2 - \frac{1}{2}\gamma y_2^2 = \beta_2 \rho q v_2 - \beta_1 \rho q v_1$$

$\beta_2 = \beta_1 = 1$ and by continuity eq.

q = Discharge per unit width =

$v_1 y_1 = v_2 y_2$

$$(y_2^2 - y_1^2) = \frac{2q^2}{g}\left(\frac{1}{y_1} - \frac{1}{y_2}\right)$$

i.e. $y_1 y_2 (y_2 + y_1) = \frac{2q^2}{2g} 2y_c^3$