Fluid Kinematics (Questions)

Q1⇒ for a 2-D flow field, the stream function ψ is given as ⇒ $\psi = \frac{3}{2}(y^2 - x^2)$. The magnitude of discharge occuring between the stream line passing through points (0,3) and (2,4).

(a) 6units (b) 3units (c) 1.5unit (d) 2units.

Q2⇒ The particle moves along a curve whose equations are ; $x = t^3 + 2t$, $y = -3e^{-2t}$ and $z = 2\sin(5t)$, where x, y and z show variations of the distance coured by the particle in cm with time 't' (in s). The magnitude of acceleration of the particle in (cm^2/s) at t = 0s ⇒

Q3⇒ A nozzle is so shaped that the average flow velocity changes linearly from 1.5m/s at the beginning to 15m/s at its end in a distance of 0.375m. The magnitude of the convective accleration (m/s2) at the end of nozzle is ⇒

Q4⇒ The circulation Γ around a circle of radius 2units for the velocity field $u = 2x + 3y$ and $v = -2y$ is ⇒

(a) -6π units (b) -12π units (c) -18π units (d) -24π units

Q5⇒ for a 2-D irrotational flow, the velocity potential is defined as $\phi = \log_e(x^2 + y^2)$, which of the following is a possible stream function ψ, for this flow ⇒

(a) $\frac{1}{2}\tan^{-1}\left(\frac{y}{x}\right)$ (b) $\tan^{-1}(y/x)$ (c) $2\tan^{-1}(y/x)$

(d) $2\tan^{-1}(x/y)$

Fluid Dynamics and Flow Measurement

Q1⇒ The percentage error in computing the discharge over a triangular notch corresponding to an error of 1% in the measurement of the head over the notch would be ⇒ (a) 1 (b) 1.5 (c) 2.0 (d) 2.5

Q2⇒ A venturimeter having a throat diameter of 0.1m is used to estimate the flow rate of a horizontal pipe of diameter 0.2m. For an observed pressure diff of 2m of water head and $C_d = 1$. assuming zero energy loss calculate the discharge in m^3/s ?

Q3⇒ A body moving through still water at 6m/s produces a water velocity of 4m/s at a point 1m ahead. The difference in pressure between the nose and the point 1mt ahead would be: (a) 2000 N/m² (b) 10000 N/m²
(c) 19620 N/m² (d) 98100 N/m²