# WAVE MECHANICS - A2

Q1. Show that the solution

$$\phi = u\left(r + \frac{D^2}{4r}\right)\cos\theta$$

satisfies all the necessary conditions for flow around a cylinder at low Reynolds Number.

Q2. Show that at small values of the Keulegan-Carpenter number, the drag coefficient $C_d$ reduces to zero and the inertia coefficient $C_m$ tends to 2.0.

Q3. A vertical cylinder of diameter 2m extends from the sea bed up through the water surface. If the local water depth is $d$ = 25m and the wave amplitude, $a$, and wave period, $T$, are 2.0m and 10sec respectively, use Morison's equation to determine the total load experienced by the cylinder. Where does the maximum force per unit length occur and what is its value? (Take $C_d = C_m = 1.2$).

Q4. A 3m diameter pipeline is positioned with its center line 3m above the bed in water which is 20m deep. The pipeline is supported by concrete pillars placed at 15m intervals. If the local current velocity is 1.5m/s use Morison's equation to determine the total force experienced by each support. (Take $C_d = C_m = 1.5$).

If the pipeline is also subject to the effects of wave loading, what would be the new value of the force per support? The design waves are given in deep water as T = 8.0sec and a=2.5m. (Assume the same values of $C_d$ and $C_m$).