Numericals –Real and apparent depth

Numerical Problem -1

1. A glass block 3.0 cm thick is placed over a stamp .Calculate the height through which the image of the stamp is raised. Refractive index of glass is 1.54.

Solution : ${}^{a}\mu_{g} = \frac{Real\ \ Dept\ h}{Apparent\ \ \ dept\ h}$ or 1.54 = $\frac{3}{Apparent\ \ \ dept\ h}$

Apparent depth = 3/ 1.54 = 1.94 cm

Height through which image is raised = 3 – 1.94 = **1.06 cm**

Practice Problems 3 :

1. A coin is placed at a depth of 15 cm in a beaker containing water. The refractive index of water is 4/3. Calculate height through which the image of the coin is raised. [3.75]

2. The floor of a water tank appears at a depth of 2.5 m. If the refractive index of water is 1.33, find the actual depth of water.

[3.325]

3. The depth of water in a bucket is 40 cm but its bottom appears to be raised by 10 cm. What is the refractive index of water? [1.33]

4. A glass (μ_g= 1.5) block of thickness 2.7 cm is placed on a postage stamp. What would be the apparent depth of the stamp if it is viewed (i) normally and (ii) obliquely above the glass slab?(ii)[1.8cm]

5. A small air bubble in a glass slab appears to be 2.4 cm from the surface. Calculate the real depth of the bubble if the RI of glass = 1.5

[3.60 cm]

Numerical Problem 2:

1. A postage stamp placed under a glass, appears raised by 8 mm. If refractive index of glass is 1.5, calculate the actual thickness of the glass slab.

Solution: Let the real thickness of glass = x

Apparent thickness = (x - 8) mm

We know μ = $\frac{Real\ \ dept\ h}{Apparent\ \ \ dept\ h}$ or 1.5 = $\frac{x}{x-8}$

1.5x – 12 = x or x = **24 mm**

Practice Problems:

1. A stone placed at the bottom of a water tank appears raised by 80 cm . If the refractive index of water is 4/3, find the actual depth of water in the tank. [320 cm]

2. A postage stamp kept below a rectangular glass block of refractive index 1.5 when viewed from vertically above it, appears to be raised by 7.0mm.Calculate the thickness of the glass block. [2.1cm]