

# Assignment-2

AI1110: Probability And Random Variables  
IIT Hyderabad

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**Q13(b) Evaluate the given finite integral.**

$$\int_0^{\pi/2} \frac{\cos^2 x}{1 + \sin x \cos x} dx$$

**Solution:-**

$$I = \int_0^{\pi/2} \frac{\cos^2(x)}{1 + \sin x \cos x} dx = \int_0^{\pi/2} \frac{\cos^2(\pi/2 - x)}{1 + \sin(\pi/2 - x) \cos(\pi - x)} dx$$

$$I + I = \int_0^{\pi/2} \frac{\cos^2 x}{1 + \sin x \cos x} dx + \int_0^{\pi/2} \frac{\cos^2 x}{1 + \sin x \cos x} dx$$

$$2I = \int_0^{\pi/2} \frac{\sec^2 x}{\tan^2 x + \tan x + 1} dx$$

$$= 2/\sqrt{3} [\tan^{-1}(\infty) - \tan^{-1}(1/\sqrt{3})]$$

$$2/\sqrt{3} [\tan^{-1}(\tan(\pi/2)) - \tan^{-1}(\tan \pi/6)]$$

$$2I = 2/\sqrt{3} (\pi/2 - \pi/6)$$

$$\text{therefore, } I = \pi/3\sqrt{3}(1)$$