

ASG-3

1) Compute following Integrals: (Results provided)

$$1) \quad \int_0^{2\pi} \frac{d\theta}{a \pm b \cos \theta} = \frac{2\pi}{(a^2 - b^2)^{1/2}} \quad a > |b|$$

$$\cdot \quad \int_0^{\pi} \frac{d\theta}{(a + \cos \theta)^2} = \frac{\pi a}{(a^2 - 1)^{3/2}} \quad a > 1$$

$$\cdot \quad \int_0^{\infty} \frac{\sin^2 x}{x^2} dx = \frac{\pi}{2}$$

2). Unit step funⁿ is defined as,

$$\theta(s-a) = 0, \quad s < a$$

$$= 1, \quad s > a$$

Show that, $\theta(s)$ has integral representations

$$a) \quad \theta(s) = \lim_{\epsilon \rightarrow 0^+} \frac{1}{2\pi i} \int_{-\infty}^{\infty} \frac{e^{ixs}}{x - i\epsilon} dx$$

$$b) \quad \theta(s) = \frac{1}{2} + \frac{1}{2\pi i} P \int_{-\infty}^{\infty} \frac{e^{ixs}}{x} dx.$$