With necessary assumptions, find the Characteristic Equation of the nth order system given below

$$\frac{d^n y(t)}{dt^n} + a_{n-1}\frac{d^{n-1}y(t)}{dt^{n-1}} + a_{n-2}\frac{d^{n-2}y(t)}{dt^{n-2}} + \cdots + a_1\frac{dy(t)}{dt} + a_0 y(t)$$
$$= b_m\frac{d^m u(t)}{dt^m} + b_{m-1}\frac{d^{m-1}u(t)}{dt^{m-1}} + b_{n-2}\frac{d^{m-2}u(t)}{dt^{m-2}} + \cdots + b_1\frac{du(t)}{dt} + b_0 u(t)$$

Hence find the characteristic equation of the system described by the differential equation

$$\frac{d^2 y(t)}{dt^2} + \frac{dy(t)}{dt} + y(t) = u(t)$$

Submission deadline: 8 am on 25.12.2025