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- 5 a Design a digital Butterworth low pass filter that satisfies the following constraint using IIM. Assume  $T = 1 \text{ sec}$  [10]

$$\begin{aligned} 0.707 \leq |H(\omega)| \leq 1 & ; & \text{for } 0 < \omega < 0.3\pi \\ |H(\omega)| \leq 0.2 & ; & \text{for } 0.75\pi < \omega < \pi \end{aligned}$$

- b A digital filter is described by the following difference equation: [10]

$$y(n) = 0.7y(n-1) + 0.2x(n)$$

- i) Determine the frequency at which  $|H(\omega)| = \frac{1}{\sqrt{2}}$   
 ii) Identify the filter type based on pass band.

- 6 a An analog filter has transfer function [10]

$$H(s) = \frac{s + 0.1}{(s + 0.1)^2 + 9}$$

Determine the transfer function of digital filter using bilinear transformation.  
 The digital filter should have specification  $\omega_r = \frac{\pi}{4}$ .

- b Describe EEG and ECG signal analysis. [10]