Baseband Digital Transmission

1. **A source transmits 70% of the time 0s and 30% of the time 1s. What is the optimal threshold of detection so that the error rate is minimum? Assume that the noise is zero-mean white Gaussian with variance $\sigma^2 = 9$, and that the amplitude of the transmitted signal when 1 is indicated is A = 5, and 0 if 0 is indicated.**

2. **Find the matched filter if the channel noise is zero-mean Gaussian noise and non-white in frequency domain with the following power spectral density,**

$$S_N(f) = \frac{1}{\alpha^2 + (2\pi f)^2}$$

and the transmitted pulse is $g(t) = e^{-\alpha t}, t > 0, \alpha > 0$.