

國立臺北科技大學

九十四學年度資訊工程系碩士班入學考試

通訊概論試題

填准考證號碼

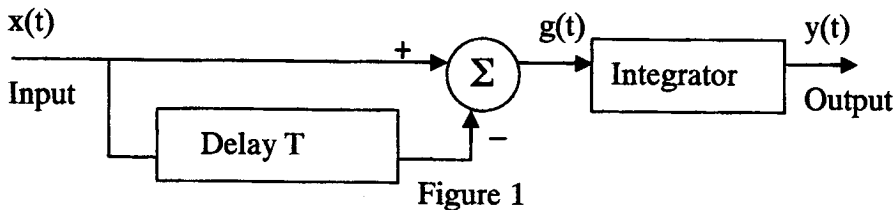
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注意事項：

1. 本試題共七題，配分共 100 分。
2. 請按順序標明題號作答，不必抄題。
3. 全部答案均須答在答案卷之答案欄內，否則不予計分。

1. (10%) Compute the fundamental frequency and find the average power of the waveform $x(t) = 10 \cos(10\pi t) + 20 \cos(20\pi t)$.
2. (15%) Derive and draw the impulse response, $h(t)$, of the following system, representing by Figure 1.



3. (15%) Derive and draw the Fourier transform and the energy spectral density of the following signal $y(t) = \frac{\sin(8\pi t) \cos(40\pi t)}{\pi}$

4. (15%) Consider a TDMA digital multiplexing system which can carry 12 voice signals. Each voice signal, with signal bandwidth of 4 k Hz, has to be sampled, uniformly quantized and then binary coded before being sent to the multiplexing system. Assume the quantized error cannot be greater than 1% of the peak-to-peak signal amplitude.
- (a) Determine L , the number of quantization levels
 - (b) Find the sampling rate, which is chosen to be 25% above the Nyquist rate, of each voice source.
 - (c) What is the output bit rate of the multiplexing system, if 10 overhead bits are added to each TDMA frame with framing duration of 0.1 msec

5. (15%) Consider a random process $Y(t) = g(t - T)$, where T is a uniformly distributed random variable in the interval (0,1) and $g(t)$ is expressed by the following formula

$$g(t) = \begin{cases} 1 & 0 \leq t \leq 1 \\ 0 & \text{otherwise} \end{cases}$$

Then, find the probability mass function (p.m.f.) and the mean of $Y(t)$.

6. (15%) In the binary communication channel, one simple technique to increase the reliability of a channel is to repeat transmitting a message several times. For example, we can send each message (0 or 1) three times. Hence the transmitted digits are 000 (for message 0) or 111 (for message 1). Due to channel noise, we may receive any one of the eight possible combinations of three binary digits. In the receiver side, the decision as to which message is actually transmitted is made by the majority rule; that is, if at least two of the three detected digits are 0, the decision is 0, and so on. Assume now P_e represents the error probability of one bit. The probability of sending bit 0 or 1 is the same. Each message is transmitted three times. Calculate the probability of making a wrong decision under this scheme. Please also describe the tradeoff factor involved by using this channel coding approach.
7. (15%) Define and briefly describe the three main ARQ (automatic repeat request) link error control strategies: stop-and-wait, go-back-N and selective-reject/repeat.