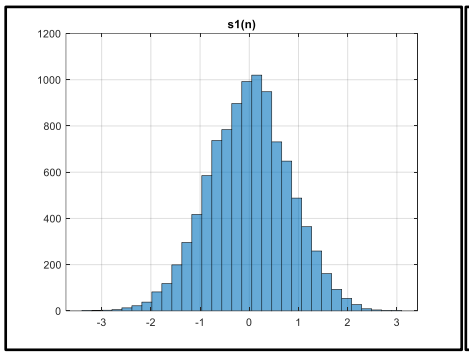
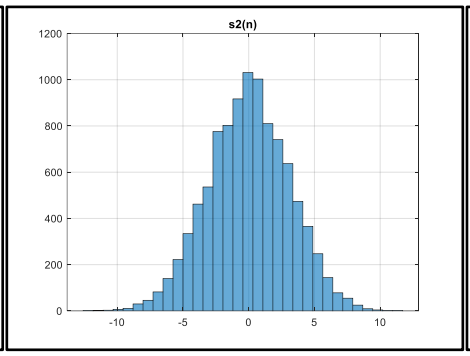
PROBLEM

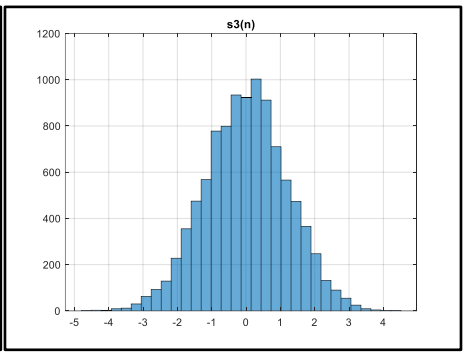
With the filter coefficients given in Practice 2 and the hybrid structure given below, conduct floating-point simulations first to determine the DR of each signal and then fixed-point simulations to determine the NOB for each signal.

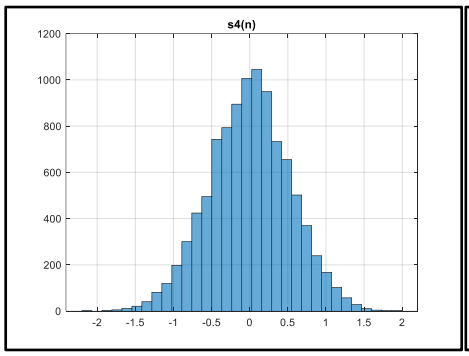
- Let the input be quantized with NOB=8 and DR=4.
- The required SQNR at out is 35 dB.
- The goal is to meet the SQNR requirement with the least number of bits used in signals.

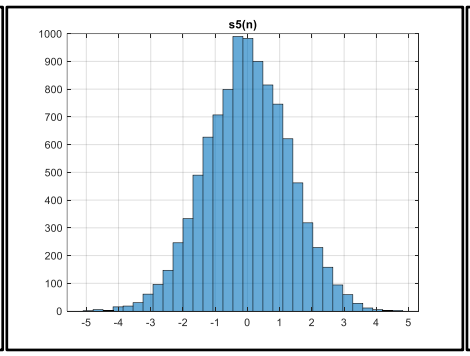
I. 先畫出每個訊號的分布圖，決定 DR 要設定多少

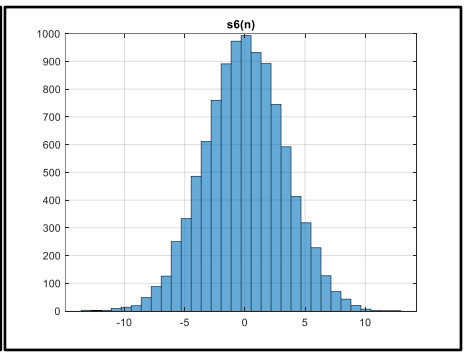


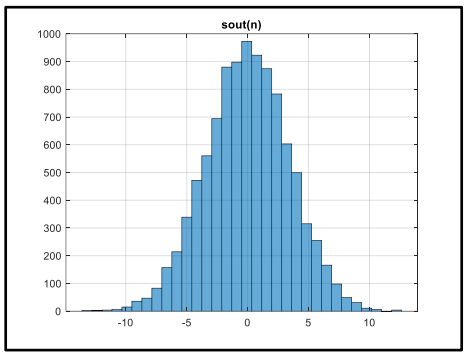












II. 設定完 DR 後再試著降低 NOB，但維持 SQNR >= 35dB

```
52      [xq, ~] = quantize(x, 8, 4);
53      xq1 = [0, xq(1:end-1)];
54      xq2 = [0, 0, xq(1:end-2)];
55      [hq, ~] = quantize(h, 8, 4);
56      [s1q, ~] = quantize(xq*hq(1), 8, 4);
57      [s2q, ~] = quantize(xq1*hq(2), 9, 16);
58      [s3q, ~] = quantize(xq1*hq(3), 8, 4);
59      [s4q, ~] = quantize(xq2*hq(4), 8, 2);
60      [s5q, ~] = quantize(s3q+s4q, 8, 4);
61      s5q1 = [0, s5q(1:end-1)];
62      [s6q, ~] = quantize(s2q+s5q1, 9, 16);
63      [soutq, ~] = quantize(s1q+s6q, 9, 16);
64
65      SQNR = mean(soutq.^2)/mean((soutq-sout).^2);
66      SQNR = 10*log10(SQNR);
```