2.34) $x[n] = \cos(\Omega_0 nT)$. If $x[n]$ is periodic with a period N, then
$x(n+N) = \cos(\Omega_0 nT + \Omega_0 NT) = x(n) = \cos(\Omega_0 nT)$
This implies $\Omega_0 NT = 2\pi r$ with r any nonzero positive integer. Hence, the sampling rate must satisfy the relation $T = 2\pi r/\Omega_0 N$. If $\Omega_0 = 20$, i.e., $T = \pi/8$, then we must have $20 N \frac{\pi}{8} = 2\pi r$. The smallest value of N and r satisfying this relation are $N = 4$ and $r = 5$. The fundamental period is thus $N = 4$.

2.49) Make use of the identity $\delta(n-m) \circledast \delta(n-r) = \delta(n-m-r)$

a) $y_1(n) = x_1(n) \circledast h_1(n) = [3\delta[n-2] - 2\delta[n+1]] \circledast [-\delta(n+2) + 4\delta(n) + 2\delta(n-1)]$
$= -3\delta(n-2) \circledast \delta(n+2) + 12\delta(n-2) \circledast \delta(n) - 6\delta(n-2) \circledast \delta(n-1) + 2\delta(n+1) \circledast \delta(n+2)$
$- 8\delta(n+1) \circledast \delta(n) + 4\delta(n+1) \circledast \delta(n-1)$. Hence,
$y_1(n) = -3\delta(n) + 12\delta(n-2) - 6\delta(n-3) + 2\delta(n+3) - 8\delta(n+1) + 4\delta(n)$
$= 2\delta(n+3) - 8\delta(n+1) + \delta(n) + 12\delta(n-2) - 6\delta(n-3)$.

b) $y_2(n) = x_2(n) \circledast h_2(n) = 15\delta(n-7) + 7.5\delta(n-5) - 5\delta(n-2) + 6\delta(n-3) + 3\delta(n-1) - 2\delta(n+2)$

c) $y_3(n) = x_1(n) \circledast h_2(n) = 2\delta(n+2) - 6\delta(n-1) - 6\delta(n-3) + 4.5\delta(n-4) + 9\delta(n-6)$

d) $y_4(n) = x_2(n) \circledast h_1(n) = -2\delta(n+3) + 8\delta(n+1) - 4\delta(n) - 5\delta(n-1) + 20\delta(n-3) - 10\delta(n-4)$