In [1]:
```
import numpy as np
import matplotlib.pyplot as plt
```

In [2]:
```
# OFDM Parameters
num_subcarriers = 64 # Number of subcarriers (N)
num_symbols = 10     # Number of OFDM symbols (M)
cp_len = 16          # Length of Cyclic Prefix (CP)
mod_order = 4        # QAM modulation order (e.g QPSK -> 4)
```

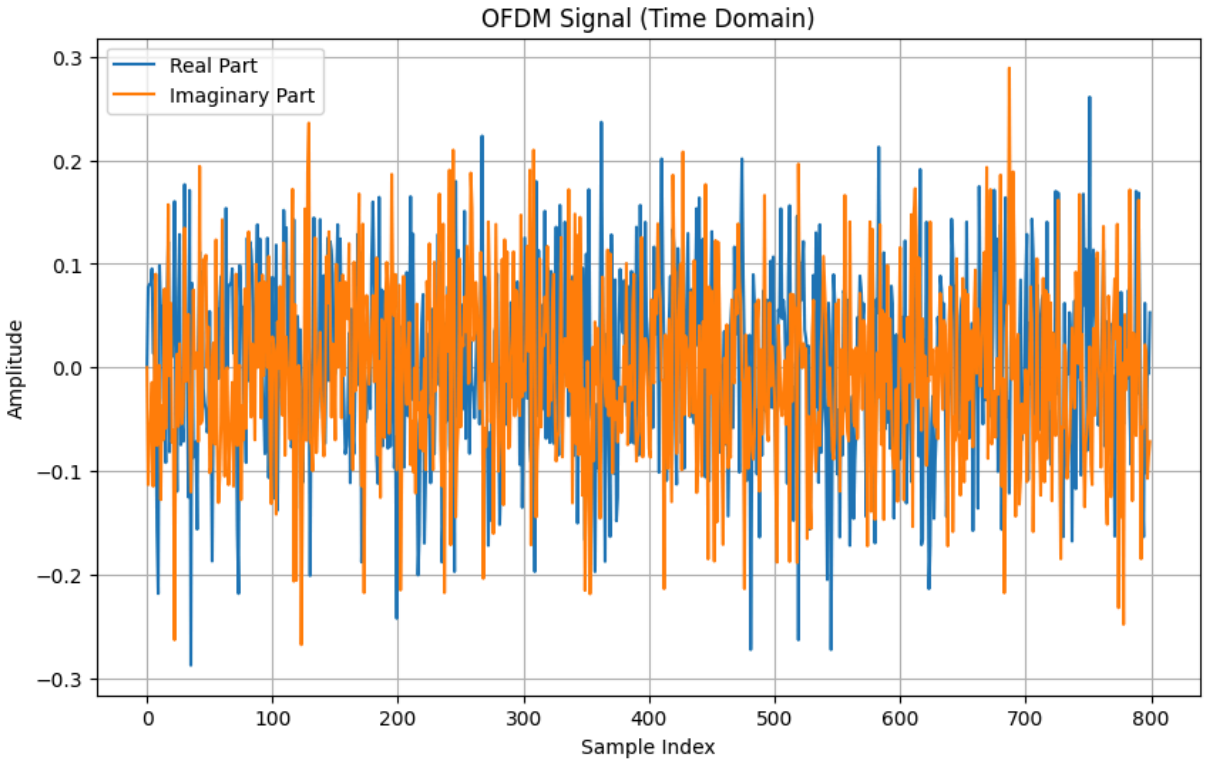
In [3]:
```
# Generate random QAM Symbols for each subcarrier
data = np.random.randint(0, mod_order, size=(num_symbols, num_subcarriers))
qam_symbols = np.exp(1j * 2 * np.pi * data / mod_order)
```

In [4]:
```
# Perform IFFT on each OFDM symbol (modulate subcarriers)
ifft_output = np.fft.ifft(qam_symbols, axis=1)
```

In [5]:
```
# Add Cyclic Prefix (CP)
cyclic_prefix = ifft_output[:, -cp_len:]
ofdm_symbols_with_cp = np.hstack([cyclic_prefix, ifft_output])
```

In [6]:
```
# Flatten into a 1D signal for transmission
ofdm_signal = ofdm_symbols_with_cp.flatten()
```

In [7]:
```
# Plot the real & imaginary parts of the OFDM signal
plt.figure(figsize=(10, 6))
plt.plot(np.real(ofdm_signal), label='Real Part')
plt.plot(np.imag(ofdm_signal), label='Imaginary Part')
plt.title('OFDM Signal (Time Domain)')
plt.xlabel('Sample Index')
plt.ylabel('Amplitude')
plt.legend()
plt.grid(True)
plt.show()
```


OFDM Signal (Time Domain)
Real Part
Imaginary Part
Amplitude
Sample Index
0.3
0.2
0.1
0.0
−0.1
−0.2
−0.3
0
100
200
300
400
500
600
700
800