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In[1]:= Z = PauliMatrix[3];
X = PauliMatrix[1];
RxB1 = MatrixExp[-I * B1 * PauliMatrix[1]];
RxB1t = MatrixExp[I * B1 * PauliMatrix[1]];
RxB2 = MatrixExp[-I * B2 * PauliMatrix[1]];
RxB2t = MatrixExp[I * B2 * PauliMatrix[1]];

In[7]:= ca = 2;
cb = 1;
ha = 4;
hb = 3;

In[11]:= Z0 = (IdentityMatrix[2^6] - KroneckerProduct[Z, IdentityMatrix[2^5]]) / 2;
Z1 = (IdentityMatrix[2^6] -
      KroneckerProduct[IdentityMatrix[2], Z, IdentityMatrix[2^4]]) / 2;
Z2 = (IdentityMatrix[2^6] - KroneckerProduct[IdentityMatrix[4],
      Z, IdentityMatrix[2^3]]) / 2;
Z3 = (IdentityMatrix[2^6] - KroneckerProduct[IdentityMatrix[8],
      Z, IdentityMatrix[2^2]]) / 2;
Z4 = (IdentityMatrix[2^6] - KroneckerProduct[IdentityMatrix[16],
      Z, IdentityMatrix[2]]) / 2;
Z5 = (IdentityMatrix[2^6] - KroneckerProduct[IdentityMatrix[32], Z]) / 2;

In[16]:= H = ha (Z0 + Z1) + hb (Z2 + Z3 + Z4 + Z5) -
      (ca (Z0 + Z1) + cb (Z2 + Z3 + Z4 + Z5) - 4 IdentityMatrix[2^6]) .
      (ca (Z0 + Z1) + cb (Z2 + Z3 + Z4 + Z5) - 4 IdentityMatrix[2^6]);

In[17]:= UG1 = MatrixExp[-I * G1 * H];
UG2 = MatrixExp[-I * G2 * H];
UG1t = Refine[ConjugateTranspose[UG1], {Element[G1, Reals]}];
UG2t = Refine[ConjugateTranspose[UG2], {Element[G2, Reals]}];
VB1 = KroneckerProduct[RxB1, RxB1, RxB1, RxB1, RxB1, RxB1];
VB2 = KroneckerProduct[RxB2, RxB2, RxB2, RxB2, RxB2, RxB2];
VB1t = KroneckerProduct[RxB1t, RxB1t, RxB1t, RxB1t, RxB1t, RxB1t];
VB2t = KroneckerProduct[RxB2t, RxB2t, RxB2t, RxB2t, RxB2t, RxB2t];

In[ ]:= UP = {{1}, {0}};
PM6 = HadamardMatrix[2^6].KroneckerProduct[UP, UP, UP, UP, UP, UP];

```

In[ ]:=

In[ ]:= Result = Transpose[PM6].UG1t.VB1t.H.VB1.UG1.PM6

Out[ ]:=

{ { ... 1 ... } }

large output
show less
show more
show all
set size limit...

In[ ]:=

```

In[ ]:= ResultFunc[G1_, B1_] = Result[[1, 1]];
FindMaximum[{ResultFunc[G1, B1], 0 < G1 < 3.14 && 0 < B1 < 3.14}, {G1, B1}]

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Out[ ]:= {10.4052, {G1 → 0.150991, B1 → 0.332161}}

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In[ ]:= ResultFunc[0.3139939445455477, 0.31400000000000006]
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Out[ ]:= 8.73948 + 3.747 × 10-16 i
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```
In[ ]:= Result2 = Transpose[PM6].UG1t.VB1t.UG2t.VB2t.H.VB2.UG2.VB1.UG1.PM6
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Out[ ]:=
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$$\left\{ \left\{ \frac{1}{8} e^{-4 i G_1} \left( \dots 21 \dots + e^{-4 i G_2} \cos[B_1]^6 \left( 12 \cos[B_2]^2 \sin[B_2]^4 \left( \dots 1 \dots \right) + \dots 17 \dots + 16 \sin[B_2]^6 \left( e^{-16 i G_2} \cos[B_2]^6 \left( \frac{1}{8} e^{-16 i G_1} \cos[B_1]^6 + \frac{1}{4} i \cos[B_1]^5 \sin[B_1] + \dots 14 \dots + \frac{1}{4} i e^{12 i G_1} \cos[B_1] \sin[B_1]^5 - \frac{1}{8} e^{4 i G_1} \sin[B_1]^6 \right) + \dots 21 \dots \right) \right) + \frac{1}{2} e^{-8 i G_1} \left( -i e^{16 i G_2} \cos[B_1] \sin[B_1]^5 \left( \dots 1 \dots \right) + \dots 34 \dots \right) + \frac{1}{4} e^{\dots 1 \dots} \left( -i \dots 3 \dots \left( \dots 1 \dots \right) + \dots 29 \dots \right) + \dots 9 \dots + \dots 1 \dots + \frac{1}{4} \left( \dots 1 \dots \right) + \frac{1}{8} e^{16 i G_1} \left( \dots 1 \dots \right) \right\} \right\}$$

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```
In[ ]:= Export["H:\\QC\\Qiskit\\QA0A\\Utility\\2Product_System\\Test.txt", Result2]
```

```
Out[ ]:= H:\\QC\\Qiskit\\QA0A\\Utility\\2Product_System\\Test.txt
```

```
In[ ]:= Result2Func[G1_, B1_, G2_, B2_] = Result2[[1, 1]];
```

```
FindMaximum[{Result2Func[G1, B1, G2, B2],
```

```
0 < G1 < 3.14 && 0 < B1 < 3.14 && 0 < G2 < 3.14 && 0 < B2 < 3.14}, {G1, B1, G2, B2}]
```