⚛️Lab 2 hints.

Sorry for late because lab 2 was challenging. It requires good python and understanding of qaoa, qubo and other topic that was in lectures.

⚛️Ex_1:

First read all the previous cell and examples. Then look at the max cut formula they gave. You will have to construct it with python. It requires 3 arguments. W, n and x in the equation.
They already provided that with weight_matrix. So use it as w. Then the 2nd argument they have is bitstring. This is the x. And for n they gave size.
So use all these and return value. You will need to use 2 for loop for this. So make it and you will get value. Remember that if you don't do this right it will cause problem in ur other ex.

⚛️Ex _2:

There are 3 example cell before ex2 cell. Read them

soooo well. Because you will have to use the same way for this ex2. For this exercise you don't need to build any formula with code. Just follow the 3 previous cell and if you miss even one of the step then your code will be error.
Then carefully read the question what they asked for. Many of us did mistake here. So use the binary variables, also don't forget to do the maximize, caz it's a max cut problem and by default you guys will see minimum. So use .maximum.
Another error everyone faced while using name =x_i. It will say this is alredy taken error. So instead of that use this as name. name= 'x_'+str(i) It will solve this error.

⚛️Ex_3:

Now it comes the hardest one. You will have to make the circuit. So see very carefully those 3 equation of R.x, R.z, R.zz. understand how the rotation parameters works there. You will have to write 3 code making those 3 formulas. Let's talk one by one.

1.First the R.z
Check the cell at the starting of the lab. There you will find how they added rz or rx gates with circuits. So try understand that well. Next you will have to write code inside the circuit to build the gamma parameters as shown in the equations. In the equation of r.zz you will see there is Ci. That is the qubo_linearity argument here. Q is the qubo_matrix. You will have to sum all Q and add to the Ci. Then you use them in the circuit you making as permanent. They alredy gave gamma and beta so use them according to the formula.
I know this seems so complicated but when you will try to make it according to the example they gave, it will make more sense.
Extra hint>>> use 2 for lop and inside the circuit use one variable because it's not entangled circuit. Caz it will just be for each qubits. Means each rz for each qubits.
[If my words make no sense then you should work more on the topic]

2. Rzz.
Same as rz. Just its formula is different so

construct it accordingly shown for rzz.
Extra hints>>> 2 for loops and i not equal to j. Its entangled circuit so you will have to use i, j for the every 2 qubits that are entangled. Write it inside the circuit.

3. R.x
It is the easy one. Same as others. Just one for loop. And its betas parameter.

⚛️Ex_4

Huh. If you successfully completed 1 2 3 this one will be easy for you. If not then this one wont work. Read all the cells for better understanding. But the main part start from cvar cell. Read it well. Here also same. You will have to creat code for the formula given. The first f(theta) formula they alredy wrote it in the cell. If cvar is none it's the first formula and they alredy did it. You will have to wrote the 2nd formula after else part.

If you successful did ex3 then this formula coding

will be so easy for you guys. Just try it and you will get it.

Extra hints>>> use np.math.ceil for changing float into int. Because cvar is a float parameter. So when you use, it will give you float which you can't use as range in for loop. So do that to make it int. Also sort the measured_cut lists for right alignment. [A common error will occur if you didn't turn of that rise error line that is alredy whitten after else. So use # or erase this line. Or else it will cause error. ]

Conclusion:
Lab 2 is really very challenging. So be patient and keep trying. And for any help ask in the #lab-2. Many mentors and qualified students are keep helping all the time.

Best of luck eveyone. 😇