This is a rough idea. We didn't have enough time write a complete quiz and solution.

Intro to Quantum Optics

1. Let's say if you have a light bulb with 30 watts power. How many photons are emitted in a second?
2. A quantum state of light has an x-quadrature variance of 2 units, what is the p-quadrature variance? (set $\hbar = 2$)
   (A) 0.5
   (B) 1
   (C) 4
   (D) cannot be determined
3. Which one of the following (x,p)-quadrature variance pair can be the (x,p)-quadrature variance of a displaced coherent state?
   (A) (1,1)
   (B) (0.5,2)
   (C) (1,2)
   (D) (0.25,0.75)
4. A squeezed vacuum state has an x-quadrature variance of 0.25 units, what is the p-quadrature variance?
   (A) Exactly 4
   (B) Greater than or equal to 4
   (C) Less than or equal to 4
   (D) Strictly greater than 4
   (E) Strictly lower than 4
5. Declare a circuit with 5 qumodes and initialize the first four as vacuum state and the final qumode as a displaced coherent state.
6. Perform a quadrature measurement at 30 degrees, 5000 times, on a squeezed state at X axis with parameter r = 1.

Gates

1. Adding two quadratures can be done by using …
   (A) Beamsplitter
   (B) CX
   (C) Quadratic phase
   (D) Cubic phase
   (E) Cross-Kerr
2. X quadrature distribution of squeezed light at 45 degrees direction is …
   (A) Gaussian
   (B) Non-Gaussian
3. Given
   $P(s) = R(\theta)S\left(re^{i\phi}\right)$
   and
   $P^{\dagger}(s)\hat{x}P(s) = \hat{x}$
   $P^{\dagger}(s)\hat{p}P(s) = \hat{p} + s\hat{x}$
   Determine the relation of s, $\theta$, r, and $\phi$.

4. Ask to predict the quadratures after a BS with certain parameters with a given input.

Hardware

1. Select the advantage(s) of photonic quantum computing platform:
    a. Can work in room-temperature
    b. Can use time-domain multiplexing to make it scalable
    c. Can use frequency-domain multiplexing to make it scalable
    d. Easy to make photon-photon interaction
2. Xanadu photonic quantum computing platform is based on:
    a. Discrete variable model
    b. Hybrid model
    c. Continuous variable model
3. Select the quantum computing hardware name from Xanadu:
    a. Eagle
    b. X8
    c. Bristlecon
    d. Spin-2
4. X8 hardware is based on time-domain multiplexing circuit:
    a. True
    b. False
5. How many stage of delay line does Borealis has?
    a. 2
    b. 3
    c. 4
    d. 5

Time-domain circuit and entanglement

1. What is the angle in the phase shift/ rotation gate if you want to create EPR state?
    a. Pi/4
    b. Pi/2
    c. Pi
    d. 2*pi
2. What value is entangled in our quantum circuit?
    a. Quadrature
    b. Photon number
    c. Phase
    d. Frequency
3. When we increase the squeezing parameter, variance of quadrature difference:
    a. Increased
    b. Decreased
4. Time-domain circuit enables us to create n entangled state without needing to scale the hardware:
    a. True
    b. False

GKP states

1. Which statement is true regarding GKP states?

   (A) Given that we can prepare a perfect GKP state, error correction can be done very easily using elementary operations.
   (B) Perfect GKP state has infinite energy.
   (C) T-gate, being a non-Clifford gate, will bring a GKP state outside the space spanned by the GKP basis.
   (D) Magic state is not a GKP state.
   (E) Homodyne measurement on GKP states corresponds to Pauli basis measurement on qubits.
2. Which sequence of operations below will give us an EPR pair? (multiple choice)
3. What is the effect of applying a T-gate on magic state? (multiple choice)
4. Which statement is true?
   (A) Clifford gates comprise a set of operations for universal quantum computing
   (B) The Wigner function of a GKP state is never negative
   (C) Pauli Y corresponds to Homodyne measurement at a 45 degrees angle with respect to X quadrature axis
5. What does a quadratic phase do on a GKP state? (multiple choice)

References:

https://strawberryfields.ai