Module 5: Multiple choice questions:

1. In a coherent state the probability of detecting 2 photons is 1% of the probability of detecting one photon. The probability of detecting no photons is

   a) 99%
   b) 98%
   c) 1%
   d) Zero

2. The total number of photons in the following state is
$$|\psi\rangle = \frac{1}{\sqrt{3}}[|1_1, 0_2, 0_3\rangle + |0_1, 1_2, 0_3\rangle + |0_1, 0_2, 1_3\rangle]$$
   a) Three
   b) Two
   c) One
   d) Cannot be specified

3. A two mode state defined by
$$|\psi\rangle = |1_1, 1_2\rangle$$
   State which of the following statements are true:

   a) This is an eigen state of the total photon number operator
   b) This is not an eigenstate of the total photon number operator
   c) This is an eigen state of the electric field operator.
   d) The number of photons in each state is undefined.

4. A two mode state is given by
$$|\psi\rangle = A(|0\rangle_1 + |1\rangle_1)|1\rangle_2$$

   Subscripts 1 and 2 refer to the mode numbers. State which of the following statements are true:
   a) This is an eigenstate of the total photon number opearator
   b) This is not an eigenstate of the total photon number operator
   c) This is an eigenstate of the photon number operator corresponding to mode 1
   d) This is an eigenstate of the photon number operator corresponding to mode 2

5. Consider the following two two mode states:
$$|\psi\rangle_1 = |2_1, 2_2\rangle$$
And
$$|\psi\rangle_2 = \frac{\sqrt{3}}{2}|2_1\rangle + \frac{1}{2}|2_2\rangle$$

a) Both the states contain two photons each
b) Both states contain four photons
c) State $|\psi\rangle_1$ contains 2 photons while state $|\psi\rangle_2$ contains 4 photons
d) State $|\psi\rangle_1$ contains 4 photons while state $|\psi\rangle_2$ contains 2 photons

Answers of module 5 MCQs:

A1: [Ans: only (b)]

A2: [Ans: only (c)]

A3: [Ans: only (a)]

A4: [Ans: only (b)&(d)]

A5: [Ans: only (d)]