Assignment 7

The due date for submitting this assignment has passed.

Due on 2021-03-10, 23:59 IST.

As per our records you have not submitted this assignment.

1) **Assertion:** The polarization of light is not maintained in a normal single mode fiber (SMF) due to non-degeneracy between the two orthogonal modes.   *1 point*

   Reason: Stress-induced birefringence is incorporated in a polarization maintaining fiber to break the degeneracy between the polarized modes HE_{11}^{o} and HE_{11}^{e}.

   ○ Both Assertion and Reason are correct
   ○ Assertion is correct but the Reason is not sufficient
   ○ Both Assertion and reason are wrong
   ○ Assertion is wrong but the Reason is correct

   No, the answer is incorrect.
   Score: 0
   Accepted Answers:
   Assertion is wrong but the Reason is correct

2) In phase generated carrier(PGC) method, what are the frequency components present in the output amplitude spectrum if the phase of the detected signal $\phi(t)$ is 0.   *1 point*

   ○ $f_c, 2f_c, 3f_c \ldots$
   ○ $f_c, 4f_c \ldots$
   ○ $DC, 2f_c, 4f_c \ldots$
   ○ $f_c, 3f_c \ldots$

   No, the answer is incorrect.
   Score: 0
   Accepted Answers:
   DC, 2f_c, 4f_c...

3) A hydrophone is typically used to detect underwater acoustic signals by detecting the phase changes in the light propagating through an optical fiber coil in response to the acoustic waves. Suppose we use a PGC scheme with a carrier frequency of 10 kHz and we observe a frequency component of 30.2 KHz in the output spectrum. What is the frequency of the acoustic signal?   *1 point*

   ○ 200 Hz
   ○ 2 KHz
   ○ 30.2 KHz
   ○ 60.4 KHz

   No, the answer is incorrect.
   Score: 0
   Accepted Answers:
   200 Hz

4) In an unbalanced interferometer powered by a laser diode, the primary noise source is the phase noise due to the fluctuation of the emission frequency of the laser and it actually limits the minimum detectable phase shift in the interferometer. If the frequency instability of the source is 1 MHz and the path difference in the interferometer is 10 cm, then the minimum detectable phase shift is _____ mrad (two decimal place accuracy)

   [   ]

   No, the answer is incorrect.
   Score: 0
   Accepted Answers:
   (Type: Range) 1.9,2.2

   1 point

5) The intensity of a single longitudinal mode laser depends on the mean number of photons exiting a cavity. If the intensity is determined as the square of the electric field magnitude, $|E|^2$ and $\tilde{n}$ is the mean number of photons, which of the following relation holds good?   *1 point*

   ○ $|E|^2 \propto \tilde{n}^2$
   ○ $|E|^2 \propto \sqrt{\tilde{n}}$
   ○ $|E| \propto \sqrt{\tilde{n}}$
   ○ None of the above

   No, the answer is incorrect.
   Score: 0
   Accepted Answers:
   $|E| \propto \sqrt{\tilde{n}}$

6) The mean number of photons for a given optical source is 10^9. If the spontaneously emitted photons is 10^3 then the RMS value of the phase uncertainty is _____ (scientific notation with two decimal accuracy)

   [   ]

   No, the answer is incorrect.
   Score: 0
   Accepted Answers:
   (Type: Range) 6.5e-4,7.5e-4

   1 point

7) **Assertion:** Phase of the actual emitted photon from an optical source has got an uncertainty.   *1 point*

   Reason: The phase uncertainty is due to stimulated emission photons.

   ○ Both Assertion and Reason are correct
   ○ Assertion is correct, but the Reason is not correct
   ○ Both Assertion and reason are wrong
   ○ Assertion is wrong but the Reason is correct

   No, the answer is incorrect.
   Score: 0
   Accepted Answers:
   Assertion is correct, but the Reason is not correct

8) A high finesse Fabry-Perot laser cavity is characterized by an average photon lifetime of 100 ps and an inversion ratio of 0.8 for the gain medium. If the measured phase uncertainty is 6.32×10^{-5} for an observation time of 1 ns, the corresponding mean number of photons emitted from the source is _____ (scientific notation with one decimal accuracy)

   [   ]

   No, the answer is incorrect.
   Score: 0
   Accepted Answers:
   (Type: Range) 0.9e9,1.1e9

   1 point

9) Whether the following statement is True/false   *1 point*

   Statement: An optical source with low level of frequency uncertainty leads to high temporal coherence.

   ○ True
   ○ False

   No, the answer is incorrect.
   Score: 0
   Accepted Answers:
   True

10) **Assertion:** The phase uncertainty of the laser source is dependent on the number of spontaneously emitted photons.   *1 point*

   Reason: The number of spontaneously emitted photons can be reduced by selecting high finesse cavity.

   ○ Both Assertion and Reason are correct
   ○ Assertion is correct but the Reason is not sufficient
   ○ Both Assertion and reason are wrong
   ○ Assertion is wrong but the Reason is correct

   No, the answer is incorrect.
   Score: 0
   Accepted Answers:
   Both Assertion and Reason are correct