Assignment 10

The due date for submitting this assignment has passed.

Due on 2021-03-31, 23:59 IST.

As per our records you have not submitted this assignment.

Instructions:

1. Answer all questions; all questions carry equal mark.
2. All symbols have their usual meanings.
3. Only one of the options is correct.
4. Take care of the units in numerical problems, to match with the units given in the options (of MCQs), and the units in which answers have to be entered (in *fill in the blank* type of questions).
5. In the *fill in the blank* type of questions, only the numerical values have to be entered.

NOTE: You can see the correct answers after the last date of submission. Marks obtained in this quiz will be counted towards your final score. You can take the quiz and submit it any number of times, and the latest submitted answers will be taken as your final submission.

1) LIDAR application uses pulsed laser light for detection and ranging. By decreasing which one of the following parameters of the pulsed light, can the spatial resolution of detection be improved? ***1 point***

- Peak power
- Average power
- Pulse width
- Repetition rate

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

2) State whether the following statement is TRUE or FALSE: ***1 point***

Pulsed lasers are used in laser surgery because they can ablate a highly localized target with minimal collateral damage to other body parts because of high peak power and low average power of the laser.

- TRUE
- FALSE

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

3) A mechanical chopper is used to modulate a CW laser with an output power of 5 mW. If the modulated laser output comprises of a train of rectangular pulses of 50 μs pulse duration with 25% duty cycle, then the energy per pulse obtained at the output of the modulator is ___ nJ.

(Write your answer up to 1 decimal places)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 240.0,260.0

1 point

4) In Q. 3 above, the energy conversion efficiency of the modulator in producing pulsed output is ___ %.

(Write your answer up to 1 decimal place)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 24.0,26.0

1 point

5) Which one of the following statements regarding the 'Q-switching' and 'cavity dumping' methods of pulsing lasers is *incorrect*? ***1 point***

- Both methods operate on the basis of resonator loss-switching.
- Both methods involve storing the laser energy in the resonator.
- Switching the mirror transmittance is the basis for 'Cavity dumping' method.
- Switching the laser threshold is the basis for 'Q-switching' method.

No, the answer is incorrect.
Score: 0
Accepted Answers:
Both methods involve storing the laser energy in the resonator.

6) In a particular laser, operating at a pump power above the threshold and giving CW output power, the resonator mirrors (which provide feedback) are suddenly removed. Which one of the following would occur immediately afterwards? ***1 point***

- Output power increases and population inversion decreases
- Output power decreases and population inversion increases
- Output power increases and population inversion also increases
- Output power decreases and population inversion also decreases

No, the answer is incorrect.
Score: 0
Accepted Answers:
Output power decreases and population inversion increases

7) The rate of loss-switching by the modulator in a Q-switched laser primarily determines which one of the following parameters of the output pulsed light. ***1 point***

- Pulse width
- Pulse Repetition rate
- Energy per pulse
- Peak power of the pulse

No, the answer is incorrect.
Score: 0
Accepted Answers:
Pulse Repetition rate

8) A multi-longitudinal mode gas laser of cavity length 15 cm is oscillating with 8 longitudinal modes. The ratio of the peak output powers, when the longitudinal modes are (i) in the phase- locked condition and (ii) in the random-phased condition, is ___. (Assume that all longitudinal modes have equal amplitudes)

(Write your answer up to 2 decimal places)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 6.61,7.61

1 point

9) In Q. 8 above, for the case of phase-locked condition, the pulse width of the output pulses is ___ ns.

(Write your answer up to 3 decimal places)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 0.110,0.140

1 point

10) State whether the following statement is TRUE or FALSE: ***1 point***

In a passive mode-locked laser using a saturable absorber, the relaxation time of the saturable absorber must be *greater than or equal to* the cavity round-trip time (τ_c).

- TRUE
- FALSE

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