

Name Admission No:

ABES Institute of Technology, Ghaziabad

Subject Code: BAS101

Subject Name: Engineering Physics

Year - 1st, Branch-All

1st ASSIGNMENT (ODD SEMESTER 2024-25)

[Time: 1 Hours]

[Total Marks: 10]

COURSE OUTCOMES

CO	Statements
4	To know the functioning of optical fiber and its properties and applications. To understand the concept, properties and applications of Laser.
Date - 27:09:2024 onwards	

(SET-A)

SECTION-A

Q.1	Attempt one Questions. (1×1=1)	CO
a.	<i>Explain</i> the concept of directionality and monochromaticity in laser.	4
b.	<i>What</i> are the necessary conditions for lasing action?	4

SECTION-B

Q.2	Attempt two Questions. (2×3=6)	CO
a.	The wavelength of He-Ne Laser is 632.8 nm and its output power is 3.147 mW. <i>How many</i> photons are emitted from laser per second?	4
b.	Ruby laser emits 1.0 J pulses of light whose wavelength is 696 nm. <i>Calculate</i> the minimum number of Cr ³⁺ ions in the ruby rod?	4
c.	<i>Explain</i> the effect of temperature on population inversion. Mention how He-Ne laser is superior to Ruby laser. Also <i>discuss</i> the role of He in this laser.	4

SECTION-C

Q.3	Attempt one Questions. (1×3=3)	CO
a.	<i>Discuss</i> the construction and working of a three levels solid state Ruby laser.	4
b.	<i>Show</i> that the probability of stimulated absorption is equal to that the probability of stimulated emission.	4

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(SET-B)

SECTION-A

Q.1	Attempt one Questions. (1×1=1)	CO
a.	<i>Differentiate</i> between spontaneous and stimulated emission of radiation.	4
b.	<i>How</i> population inversion condition is achieved in laser?	4

SECTION-B

Q.2	Attempt two Questions. (2x3=6)	CO
a.	A system has three energy levels E_1 , E_2 and E_3 . The energy levels E_1 , and E_2 are 0.0 eV and 1.4 eV respectively. If the lasing action takes place from E_3 to E_1 with wavelength of emitted photon 1.2 μm . <i>Find</i> the value of E_3 .	4
b.	<i>Calculate</i> the energy of laser pulse in a ruby laser for 2.8×10^{19} Cr^{3+} ions. If the laser emits light of wavelength 6943Å.	4
c.	<i>Calculate</i> the population ratio of two states in He-Ne laser that emits highly coherent radiation of wavelength 6500Å at 27° C.	4

SECTION-C

Q.3	Attempt one Questions. (1x3=3)	CO
a.	<i>Discuss</i> the construction and working of a four levels gaseous He-Ne laser with necessary neat and clean energy levels diagram and mention its merits over ruby laser.	4
b.	<i>Show</i> that the coefficient of spontaneous emission dominates over that of the stimulated emission more and more as the energy difference between two states increases.	4