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B. TECH.
(SEM III/IV) THEORY EXAMINATION 2017-18
LASER SYSTEMS AND APPLICATIONS

Time: 3 Hours ***Total Marks: 70***

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. 2 x 7 = 14

a. What is Quantum tunneling effect?

b. Why the spectrum of black body could not be explained by the concept of classical mechanics?

c. What is the role of reflectors in resonant cavity?

d. What are characteristics properties of Copper Vapour lasers?

e. Find the maximum power of the pulse if the measured pulse duration of a laser is 80ns and its energy is 1.8J.

f. Why dye lasers are tunable?

g. What do you mean by photocoagulation?

SECTION B

2. Attempt any *three* of the following: 7 x 3 = 21

a. What is meant by black body? Discuss Planck's hypothesis of a quantum theory of radiation and obtain and expression for the distribution of energy with wavelength in a black body radiation.

b. Give physical significance of wave function? Derive Schrodinger time-dependent and time-independent wave equations.

c. What do you understand by optical cavity? Explain various types of optical cavities with suitable diagram.

d. Explain the construction and working of Argon ion laser with applications.

e. What is dye laser? Discuss advantages, drawbacks and applications of dye lasers?

SECTION C

3. Attempt any *one* part of the following: 7 x 1 = 7

(a) What is tunnel Effect? Explain it with suitable diagram for the case E< Vo and get the transmission Coefficient

(b) What is Normalized wave function? A particle is moving in one dimensional potential box (of infinite height) of width 25Å. Calculate the probability of finding the particle within an interval of 5 Å at the centre of the box when it is in its state of least energy.

4. Attempt any *one* part of the following: 7 x 1 = 7

(a) What is a Q-switched laser? Explain various techniques used in Q- switching.

(b) What do you understand by population inversion? Find the temperature at which the population ratio of the two levels will be 2/4 when an atom has atomic levels separated by 1.62 eV.

5. Attempt any *one* part of the following: 7 x 1 = 7

(a) Describe alexandrite laser and its characteristics. How tuning of laser wavelengths can be done in this laser?

(b) Why is four level laser more efficient than three level laser? Calculate the Fermi temperature of iron and Fermi velocity of its electrons if its Fermi energy is 11.1 eV

6. Attempt any *one* part of the following: 7 x 1 = 7

(a) Explain four level laser with suitable diagram and derive rate equation for four level laser.

(b) What do you understand by homo junction semiconductor laser? Discuss its construction and working mechanism with diagram.

7. Attempt any *one* part of the following: 7 x 1 = 7

(a) What are the various kinds of losses that can take place in an optical fibre?

(b) Discuss advantages and disadvantages of cutting and drilling of lasers.

Physical Constants

Rest mass of electron	mo	= 9.1 x 10-31 kg
Rest mass of Proton	mp	= 1.67 x 10-27 kg
Speed of light	c	= 3 x 108 m/s
Planck Constant	h	= 6.63 x 10-34 J-s
Charge on electron	e	= 1.6 x 10-19 C
Boltzmann Constant	k	=1.38 x 10-23 J K-1