300103

December, 2019

B.Tech - 1 SEMESTER

Physics (Waves and Optics) (BSC-101C)

Time : 3 Hours]   [Max. Marks : 75

Instructions :

1. *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*

2. *Answer any four questions from Part-B in detail.*

3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART - A

1. (a) What is the effect on time period of mass spring system when it is dipped in water? (1.5)

   (b) Define sharpness of resonance. What is the bandwidth of resonance? (1.5)

   (c) Why the speed of sound in humid air is more than in dry air? (1.5)

7. Explain the principle of laser and essential requirements to produces Laser action. How is population inversion attained in a four energy level laser differs from that of a three level laser? (15)

(d) If the intensity is increased by a factor 20, by how many decibels the sound level will change. (1.5)

(e) Give the relation between critical angle and refractive index of medium. (1.5)

(f) Explain Mirage effect. Describe the condition under which this effect may occur. (1.5)

(g) Let the fringe width in Young's double slit experiment be β. What is the fringe width if the distance between the slits and the screen is doubled and slit separation is halved? (1.5)

(h) Why is the diffraction of sound waves more evident in daily experience than that of light wave? (1.5)

(i) How does tuning is achieved in dye laser? (1.5)

(j) Why optical pumping is not suitable for gas lasers? (1.5)

PART - B

2. (a) Derive expression for the average total energy and the average power dissipation in case of damped harmonic oscillator. Give reason for power dissipation. (10)

(b) Investigate the motion of a vertical spring in uniform gravitational field. (5)

3. (a) What is group velocity? Derive an expression for group velocity, also give its physical significance. (5)

(b) Calculate the velocity and frequency for transverse wave in stretched string, also discuss about the overtones produced in it. (10)

4. Describe the principle, construction and working of Michelson interferometer. How it can be used to find (i) the wavelength and (ii) the difference in wavelength between D-lines of sodium. (15)

5. (a) Discuss briefly Fermat's principle. Show that laws of Refraction and Reflection are special cases of Fermat's principle. (5)

(b) Describe with neat sketch the essential parts of a compound microscope showing the path of rays through the instrument. Obtain an expression for its magnifying power. (10)

6. (a) Explain the theory of diffraction grating. How do you explain missing order spectra? (5)

(b) A diffraction grating has 15000 lines/inch is illuminated normally by light of wavelength 6000Å. Calculate the dispersive power in second and third order spectrum. (5)