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TPH–201

B. TECH. (SECOND SEMESTER)
MID SEMESTER EXAMINATION, 2018
(ALL BRANCHES)
ENGINEERING PHYSICS

Time : 1 : 30 Hours

Maximum Marks : 50

Note : (i) This question paper contains two Sections.

(ii) Both Sections are compulsory.

Section—A

1. Fill in the blanks : (1×5=5 Marks)

   (a) For good contrast of interference fringes, the amplitudes of interfering waves should be ..... .

   (b) The principle involved in the laser is the phenomenon of ..... emission.

   (c) the substances which rotate the plane of vibration to the left, they are called ..... .

   (d) The diameter of bright rings is proportional to the square root of ..... .

(e) The resolving power of a diffraction grating is equal to the product of the total number of rulings on the grating and the ..... .

2. Attempt any *five* questions. (3×5=15 Marks)

(a) Find the intensity of a laser beam of 1 mW power and having a diameter of 1.4 mm. Assume the intensity to be uniform across the beam.

(b) What are the essential conditions for obtaining sustained interference pattern ?

(c) What is the Rayleigh criterion of resolution ?

(d) Two straight and narrow parallel slits 3 mm apart are illuminated by a monochromatic light of wavelength 5.9×10^{-5} cm. Fringes are obtained on a 60 cm distant screen from the slits. Find the value of fringe width.

(e) Calculate the thickness of a half wave plate of quartz for a wavelength of 5000 Å. Here $\mu_E = 1.553$ and $\mu_O = 1.544$.

(f) Explain the difference between interference and diffraction. Write minimum three differences.

Section—B

3. Attempt any *two* parts of choice from (a), (b) and (c). (5×2=10 Marks)

(a) What do you mean by the following terms ?

(i) Spontaneous emission

(ii) Stimulated emission

(iii) Absorption

(iv) Population inversion

(v) Pumping

(b) A parallel beam of monochromatic light is allowed to be incident normally on a plane grating having 1250 lines per cm. Calculate the wavelength of spectral line diffracted at 30°C angle in second order.

(c) A 15 cm tube containing cane sugar solution (specific rotation = 66°) shows optical rotation 7°. Calculate the strength of the solution.

4. Attempt any *two* parts of choice from (a), (b) and (c). (5×2=10 Marks)

(a) Discuss the formation of Newton's rings by reflected light. Describe the experimental arrangement and give necessary theory.

(b) Plane polarised light is incident on a plate of quartz cut with faces parallel to optic

axis. Calculate the thickness for which the phase difference between the two rays is 60°, where $\mu_O = 1.5442$ and $\mu_E = 1.5583$ and $\lambda = 5000$ Å.

(c) What are Einstein's A and B coefficients ? Derive a relation between them.

5. Attempt any *two* parts of choice from (a), (b) and (c). (5×2=10 Marks)

(a) Write down the construction and working of Ruby laser.

(b) Newton's rings are observed by keeping a spherical surface of 100 cm radius on a plan glass plate. If diameter of 15th bright ring is 0.590 cm and diameter of 5th ring is 0.336 cm, what is the wavelength of the light used ?

(c) Find the derivation of intensity of secondary maxima produced by diffraction grating.