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TPH-101

B. Tech. (First Semester)
Mid Semester EXAMINATION, 2017
(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) The resolving power of a grating is equal to the product of the total number of rulings on the grating and the
 - (b) Colours observed on the thin film of soap bubbles are due to phenomenon.
 - (c) The substances which rotate the plane of vibration to the left, they are called
 - (d) LASER is an acronym for Light Amplification by Emission of Radiation.
 - (e) An ideal polariser can have a maximum transmission of per cent.

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2. Attempt any *five* parts : (3×5=15 Marks)
- Define 'dispersive power' of a grating and obtain an expression for it.
 - Calculate the thickness of a half wave plate of quartz for a wavelength of 5,000 Å. Here $\mu_E = 1.553$ and $\mu_O = 1.544$.
 - Explain Rayleigh criterion of resolution.
 - Two coherent sources whose intensity ratio is 100 : 1 produce interference fringes. Calculate the ratio of maximum intensity to minimum intensity in fringe system.
 - 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.
 - What do you understand by coherent sources and how are they produced in practice ?

Section—B

3. Attempt any *two* parts of choice from (a), (b) and (c). (5×2=10 Marks)
- A 20 cm long tube containing sugar solution is placed between crossed nicols and is illuminated by light of wavelength 6×10^{-5} cm. If the specific rotation is 60° and optical rotation produced is 12° , what is the strength of the solution ?

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- Write down the construction and working of Ruby laser.
 - In a plane transmission grating the angle of diffraction for the second order principal maxima for $\lambda = 5 \times 10^{-5}$ cm is 30° . Calculate the number of lines in one cm of the grating surface.
4. Attempt any *two* parts of choice from (a), (b) and (c). (5×2=10 Marks)
- How can Newton's rings be used to determine the refractive index of a liquid ? Derive the necessary formula.
 - Define the following terms :
 - Spontaneous emission
 - Stimulated emission
 - Absorption
 - Population inversion and
 - Pumping.
 - Calculate the specific rotation, which rotates the plane of polarisation 15.2° in 20% sugar solution of 25 cm length.
5. Attempt any *two* parts of choice from (a), (b) and (c). (5×2=10 Marks)
- What are Einstein's A and B coefficients ? Derive a relation between them.

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(b) A sugar solution in a tube of length 20 cm produces an optical rotation of 13° . The solution is diluted to one-fourth of its previous concentration. Find the optical rotation produced by 30 cm long tube containing the dilute solution.

(c) 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 ?