Roll No. of candidate

2019

B.Tech. 1st Semester End-Term Examination

PHYSICS–101

(New Regulation) (w.e.f. 2017–18) &

(New Syllabus – Group-B) (w.e.f. 2018–19)

Full Marks – 70   Time – Three hours

The figures in the margin indicate full marks
for the questions.

Answer Question No. 1 and any *four* from the rest.

1.   Fill in the gaps of the following: $(10 \times 1 = 10)$

(i)   The differential form of Mannull's equation
_____ signifies Gauss's laws for
magnetism

(ii)   The area of the B–H loop for soft iron
compared to that of steel is ——————.

(iii)   Chromatic aberration in a lens occurs due to
the phenomenon of —————— of light.

(iv)   The central fringe of the Newton's Rings formed
by reflected light is ——————

(v) The topmost filled energy level at $0°K$ is called

_____

(vi) The potential energy of a freely moving particle in 1–D potential well is _____

(vii) Heisenberg's uncertainty principle concerning the uncertainties in the momentum and position of microscopic particle given by the equation _____

(viii) In an optical fibre the refractive index of the core is _____ than that of the cladding.

(ix) The ratio of Einstein's coefficients of spontaneous emission of stimulated emission varies with the frequency of the incident radiation as _____

(x) The Poisson's equation is reduced to the Laplace's equation in _____

2. (a) A body is moving with velocity $v = \left(2x\hat{i} + 2y\hat{j}\right)$ m/s, show that the motion of the body is irrotational.

(b) Discuss various properties of Diamagnetic, paramagnetic and Ferro magnetic substances citing examples.

(c) Show that the Ampere's law inconsistent in time varying field. In view of this establish the modified Ampere's law. (4+5+6 = 15)

3. (a) What is spherical aberration and chromatic abbreviation?

(b) Find the actual path difference between the interfering reflected rays incase of a thin film. Hence find the conditions for constructive and destructive interference.

(c) The objective of a telescope of focal length 90 cm is an achromatic combination of two lenses in contact. If the depressive powers of the lenses are 0.024 and 0.036 respectively, find the focal lengths of the two lenses. (4+7+4 = 15)

4. (a) What do you mean by population inversion in LASER? Explain briefly how it is achieved He-Ne laser.

(b) What is holography? Explain briefly about its principle.

(c) The refractive indius of the can and the cladding of an apical fibre are 1.50 and 1.47 respectively. Calculate the numerical aperture and acceptance angle. (6+4+5=15)

5. (a) Discuss the properties of a wave packet representing a quantum particle.

(b) For a 1–D potential well, solve the Schrodirger's equation to show the discrete nature of energy.

(c) The de Broglie wavelength of electron is 73 A°, find the velocity of the electron. (5+6+4 = 15)

6. (a) Explain the band theory of solids.

(b) Define Fermi level and density of status

(c) Write few merits and demerits of free electron theory. (7+4+4 = 15)

7. (a) Explain the working of light emitting Dio
(LED).

(b) What is Meissner effect? Differentiate between
type–I and type –II super conductors.

(c) The critical temperature of a metal with
isotopic mass 1995 amu is 4.185k. Calculate the
isotopic mass of the metal if the critical
temperature falls to 4.133 k.

(5+5+5 = 15)

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