

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID: 9001

Roll No.

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

B. Tech.

(Semester-I) Theory Examination 2017 - 18

ENGINEERING PHYSICS-I

Time: 3 Hours

Total Marks: 70

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

SECTION A

1. Attempt *all* questions in brief.

2 x 7 = 14

- a. Is earth an inertial or non-inertial frame of reference? Justify your answer.
- b. What is Wien's displacement law?
- c. What do you mean by group velocity?
- d. Define dispersive power of a plane transmission diffraction grating.
- e. Differentiate between spontaneous and stimulated emission of radiation.
- f. What do you mean by specific rotation?
- g. What do you mean by acceptance angle?

SECTION B

2. Attempt any *three* parts of the following:

7 x 3 = 21

- a. Obtain Galilean transformation equations. Show that length and acceleration are invariant under Galilean transformations.
- b. Derive Planck's radiation law. Show that Planck's formula for the energy distribution in a thermal spectrum is applicable for all wavelengths.
- c. Give the construction and theory of plane transmission grating. Explain the formation of spectra by it.
- d. What is the advantage of four level laser systems over three level laser systems? Describe the construction and working of ruby laser.
- e. What is holography? Explain the basic principle of holography using construction and reconstruction of image.

SECTION C

3. Attempt any *one* part of the following: 7 x 1 = 7
- (a) Deduce the relativistic velocity addition theorem. Show that it is consistent with Einstein's second postulate.
 - (b) What do you mean by time dilation? Establish a relation for it. At what speed should a clock be moved so that it may appear to lose 1 min each hour?
4. Attempt any *one* part of the following: 7 x 1 = 7
- (a) What is the concept of de-Broglie matter waves? Describe Davisson-Germer experiment and prove that electrons possess wave nature.
 - (b) Find an expression for the energy states of a particle in a one-dimensional box. Determine the probability of finding a particle trapped in a box of length L in the region from $0.45L$ to $0.55L$ for the ground state.
5. Attempt any *one* part of the following: 7 x 1 = 7
- (a) Discuss the formation of interference fringes due to a wedge-shaped thin film seen by normally reflected monochromatic light and obtain an expression for the fringe width.
 - (b) Obtain an expression for the intensity distribution due to Fraunhofer diffraction at a single slit. A light of wavelength 6000\AA falls normally on a slit of width 0.10 mm . Calculate the total angular width of the central maximum.
6. Attempt any *one* part of the following: 7 x 1 = 7
- (a) Explain the phenomenon of double refraction and discuss the various characteristics of ordinary and extraordinary rays. Find the thickness of a quarter wave plate of quartz for light of wavelength 5893 \AA . The refractive indices for ordinary and extraordinary rays are 1.544 and 1.553 respectively.
 - (b) What do you mean by optical activity? Give Fresnel's theory of optical activity and derive the necessary expression for the optical rotation.
7. Attempt any *one* part of the following: 7 x 1 = 7
- (a) Explain single mode and multimode fibers. Differentiate between characteristic properties of single mode and multimode fibers.
 - (b) Explain dispersion and attenuation in optical fiber. The optical power, after propagating through a 500 m long fiber, is reduced to 25% of its original value. Calculate fiber loss in dB/km .