

**Mid Semester Examination, September 2019**  
**B.Tech. (First Semester)**  
**(Sections F-L)**  
**Subject – Physics I**

Time: 2 Hrs.

Max. Marks: 30

*Note: Attempt all questions. Part (a) of each question is compulsory. Attempt any two parts from (b), (c), (d) of each question.*

Q.1 (a) Write and explain the postulates of the special theory of relativity?

3

(b) What do you understand by Lorentz transformation. Prove that the quantity  $x^2+y^2+z^2-c^2t^2$  remains invariant under Lorentz transformation.

6

(c) Define proper length and proper time, and derive expressions for time dilation and length contraction.

6

(d) How does the mass vary with velocity? Show that  $m = \frac{m_0}{\sqrt{1-\frac{v^2}{c^2}}}$  where symbols have their usual

meanings? Draw graph showing the variation of mass with velocity?

6

Q.2 (a) What do you mean by Rayleigh's criterion for just resolution? Explain with necessary diagram?

3

(b) Discuss the experimental setup for Newton's ring experiment. How would you determine the refractive index of a given liquid using this experiment?

6

(c) Explain diffraction due to single slit and derive the necessary conditions for maxima and minima.

6

(d) Define plane transmission grating. Light is incident normally on a grating of total ruled width  $4 \times 10^{-3}$  m with 4500 lines in all. Calculate the angular separation of two Na lines in the first order spectrum. Can they be seen distinctly?

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