PHYSICS, PAPER-I

TIME ALLOWED: THREE HOURS **PART-I(MCQS): MAXIMUM 30 MINUTES**	**PART-I (MCQS)** **PART-II**	**MAXIMUM MARKS = 20** **MAXIMUM MARKS = 80**

NOTE: (i) **Part-II** is to be attempted on the separate **Answer Book.**
(ii) Attempt **ONLY FOUR** questions from **PART-II. ALL** questions carry **EQUAL** marks.
(iii) All the parts (if any) of each Question must be attempted at one place instead of at different places.
(iv) Write Q. No. in the Answer Book in accordance with Q. No. in the Q.Paper.
(v) No Page/Space be left blank between the answers. All the blank pages of Answer Book must be crossed.
(vi) Extra attempt of any question or any part of the question will not be considered.
(vii) **Use of Calculator is allowed.**

PART – II

Q. 2. **(a)** What is Gradient of a scalar function? Give its physical significance and show that $\overrightarrow{Grad}\varphi = \vec{\nabla}.\varphi$ (10)

(b) Define the term 'acceleration' and find its Cartesian components. (06)

(c) If $\vec{A} = xz^3\hat{\imath} - 2x^2z\hat{\jmath} + 2yz^4\hat{k}$, then find curl of A at the point (1,-1,1) (04) **(20)**

Q. 3. **(a)** Explain the rotational kinetic energy and determine its formula for a disc, hoop and sphere. (10)

(b) What do you mean by the term 'inertia' in physics? Calculate respectively the rotational inertia of a solid cylinder and a hollow cylinder about an axis of symmetry. (06)

(c) Calculate the angular speed of the second's hand, minutes hand and hour's hand of a watch. (04) **(20)**

Q. 4. **(a)** What was Physics like before relativity and how did Einstein come up with his theory? Mathematically explain how mass and energy is interchangeable? (10)

(b) Discuss in detail the relativity of length using Einstein's special theory of relativity. (06)

(c) Calculate the mass equivalent of energy from an antenna radiating 10KW for 24 hours. (04) **(20)**

Q. 5. **(a)** Define capillarity and derive an expression for the rise of liquid in a capillary tube to show that the height of the liquid column supported is inversely proportional to the radius of the tube. (10)

(b) What are fluids? Write their important characteristics. (06)

(c) A cylindrical swimming pool has radius 2m and depth 1.3m. It is filled completely with salt water. (04) **(20)**
Given, density of salt water = $1.03\text{x}10^3\text{kgm}^{-3}$, volume of water = 16.34m^3, and the atmospheric pressure = $1.013\text{x}10^5\text{Pa}$. Calculate the pressure at the bottom of