

## ENGINEERING SCIENCE (867)

**This subject may not be taken with Physics.**

The syllabus is designed for candidates who have followed a course with a bias towards engineering.

The examiners will attach importance to an understanding of scientific principles and will look for evidence that these have been studied practically. The examiners may ask to see the practical notebooks.

### CLASS XI

*There will be one paper of three hours duration of 100 marks.*

*Section A of the paper will contain short answer questions, all of which are to be answered.*

*Section B of the paper will contain six questions of which candidates must answer five questions.*

*Note: All questions will be set in the S.I. System. The unit abbreviations to be used in all question papers in this subject will be those contained in the Guide to the use of International System (SI) units SP; 5-1969 (Published by the Indian Standards Institution). A list of common abbreviations is printed at the end of the Physics syllabus.*

1. Velocity and acceleration. Laws of motion. Force, mass and acceleration. Acceleration due to gravity. Measurement of  $g$ , including examples of bodies moving with variable acceleration, treated graphically.
2. Angular velocity and angular acceleration.
3. Composition and resolution of velocity. Simple problem on projectiles, involving combined horizontal and vertical motion.
4. Measurement and effects of force. Equilibrium of concurrent forces in plane. Parallelogram, triangle and polygon of forces. Reaction, resultant and equilibrant. Bow's notation. Equilibrium of body on inclined plane. Treatment by graphical and mathematical methods.
5. Moments. Application to parallel forces, levers, vertically loaded rigid beams. Centre of gravity: experimental determination and calculation in simple cases. Its relation to stability.
6. Pressure in liquids and its transmission. Principle of Archimedes; floatation. Density and specific gravity of solids and liquids. Simple hydraulic pumps and jacks. Lift and force pumps; the siphon.
7. Air Pressure. Boyle's law. Barometers. Manometers and the Bourdon gauge. The bicycle pump. (Details of the Fortin barometer are not required.)
8. Temperature and temperature scales.
9. Thermal expansion of solids, liquids and gases. Coefficient of linear expansion of solids and coefficient of cubical expansion of liquids and gases. Charles' law. Absolute temperature. (Questions will not be set on apparent coefficients of expansion).
10. Quantity of heat. Joule, Centigrade heat unit. Specific heat capacity of solids and liquids; their determination. Change of state. Latent heats: their determination. Melting and boiling points; the effect of pressure. Heat as a form of energy. Calorific value of fuels (excluding experimental determination).
11. Conduction, convection and radiation.
12. Conversion of heat to mechanical energy and vice versa. Mechanical equivalent of heat, including any one method of determination.