

### *Theory of Machines (a)*

*Kinematics*.—Pairings, Kinematic chains, mechanisms, inversion.

Methods of determining the relative velocities of parts in machines, by calculation and by graphic methods. Simple cases of acceleration diagrams.

Gears—theory of shape and action of teeth; simple, compound, and epicyclic trains. Worm gears.

*Kinetics*.—Inertia forces on elements of mechanisms; gearing—strength and durability. Use of British Standard Specification No. 436, 1940.

Engine turning moment diagrams; flywheels; governors. Balancing—rotating parts; primary balancing of reciprocating parts, including locomotive balancing and secondary balancing of “in line” engines.

A candidate in this subject will be required to present a certificate from the Principal of the institution attended that he has carried out a course of practical work of at least fifteen hours’ duration based on the above prescription and that his attendance and work have been satisfactory.

### *Theory of Machines (b)*

*Cams*.—Harmonic, constant-velocity, and constant-acceleration types; displacement, velocity, and acceleration of follower. Inertia forces on cam followers.

*Vibrations*.—Body with single degree of freedom; torsional oscillations of shafts with attached masses. Transverse vibrations of beams. Whirling of shafts. Forced vibrations with viscous damping; use of vector diagram for determination of amplitude.

*Gyroscope*.—Theory and action.

*Tractive effort and performance curves for vehicles.*

*Friction and Lubrication*.—“Dry” friction; friction circle, plate and cone clutches screws and pivots.

Belt and rope drives.

Elementary qualitative treatment of boundary and film lubrication applied to journal and thrust bearings.

General characteristics of ball and roller bearings.

A candidate in this subject will be required to present a certificate from the Principal of the institution attended that he has carried out a course of practical work of at least thirty hours’ duration based on the above prescription and that his attendance and work have been satisfactory.

### *Workshop Practice*

It is recommended that as far as possible in each stage the work attempted should be associated with a production job. For example, in the first year individual projects such as engineering tools should be provided to cover the operations set out in the syllabus.

In the subsequent stages more ambitious projects such as small drill presses, bench lathes and shaping machines would provide a good range of work to cover the syllabus. These projects may be either individual or group efforts.

### *Workshop Practice I*

The syllabus of work to be attempted is set forth in the following sections:—

- (1) The care and use of hand tools for marking out and bench work and elementary machine work.