1934

Motor Car Engineering (4th Year): Technical School Examinations 1934

Department of Education: Technical Instruction Branch

COURSE IN MOTOR CAR ENGINEERING.

AN ROINN OIDEACHAIS.
(Department of Education.)

BRAINSE AN CHEARD-OIDEACHAIS.
(Technical Instruction Branch.)

TECHNICAL SCHOOL EXAMINATIONS.
1934.

MOTOR CAR ENGINEERING.
(Fourth Year.)

Friday, May 18th—7 *p.m. to* 10 *p.m.*

Examiner—RICHARD COULSON, ESQ., A.R.C.SC.I., M.S.A.E.

Co-Examiner—J. P. HACKETT, ESQ., B.E., A.R.C.SC.I.

GENERAL INSTRUCTIONS.

You are carefully to enter on the Answer Book and Envelope supplied your Examination Number and the subject of examination, but you are not to write your name on either. No credit will be given for any Answer Book upon which your name is written, or upon which your Examination Number is not written.

You must not have with you any book, notes, or scribbling paper.

You are not allowed to write or make any marks upon your paper of questions.

You must not, under any circumstances whatever, speak to or communicate with another candidate ; and no explanation of the subject of the examination may be asked for or given.

You must remain seated until your answer-book has been taken up, and then leave the examination-room quietly. You will not be permitted to leave before the expiration of twenty minutes from the beginning of the examination, and will not be re-admitted after having once left the room.

If you break any of these rules, or use any unfair means, you are liable to be dismissed from the examination, and your examination may be cancelled by the Department.

Three hours are allowed for this paper. Answer-books, unless previously given up, will be collected at 10 *p.m.*

Instructions.

Read the General Instructions on page 1.

(*a*) Not more than Five questions in all may be attempted, of which Four must be taken from Section A, and One from Section B.

(*b*) Write the number of the question before the answer.

(*c*) Books of logarithmic and trigonometrical tables (four places) are provided. You may use a slide rule and drawing instruments.

Section A.

(*Not more than Four questions to be attempted from this Section*).

1. Make a sketch shewing the arrangement of the combustion chamber of any well-known make of compression-ignition (oil) engine and give the reasons underlying the adoption of the shape you shew.

Give an approximate figure for the compression ratio used in such an engine.

[50 marks.]

2. Describe some form of fuel injection pump suitable for use on a commercial vehicle oil engine of 4″ to 4½″ bore. Illustrate your answer with a sketch and shew in particular how the quantity of fuel injected is controlled.

Name the make of pump you describe.

[50 marks.]

3. Specify a suitable steel for the gudgeon pins of an internal combustion engine and outline the heat-treatment it should receive in order to give the necessary hardness of case and toughness of core.

Making use of the formula :—

$$F = 0{\cdot}00034wRN^2\left(1 \pm \frac{1}{n}\right)$$

calculate the maximum shearing stress on the cross-section of the hollow gudgeon pins of an engine having a stroke of 5½ ins. and connecting rods 4¼ cranks long, at 2,500 r.p.m. The gudgeon pins are 1⅛ ins. outside diameter and ⅜ ins. bore, the weight of a piston, complete with rings, is 30 ozs.

[50 marks.]

4. Discuss the conditions which are likely to affect the rate of cylinder wall wear in internal combustion engines. Your answer should deal with such matters as oil dilution ; the speed at which the engine is warmed-up after starting ; the general operating temperature ; purity of fuels, and the material used for the cylinder walls.

[50 marks.]

5. Describe the construction and action of the Wilson Pre-selective Gearbox, making use of diagrammatic sketches where necessary, to illustrate your description.

[50 marks.]

6. Give an account of recent developments in the direction of independent wheel suspension for motor vehicles and explain the objects in view in such designs.

Sketch the construction as carried out in the case of front wheel suspension by any prominent manufacturer.

[50 marks.]

Section B.

(*Not more than One question to be attempted from this Section. In answering the question, dimensions need not be inserted, but marks will be awarded for the correct proportioning of parts. Scale, full size.*)

7. Shew, in longitudinal section, the front camshaft bearing of a 75 mm. bore engine. Include the chain wheel or the spur gear driving the shaft, in section : the shaft itself in elevation, except in so far as it may be necessary to section it in order to shew the provision made to prevent end movement.

[100 marks.]

8. Make a drawing shewing, in longitudinal section, an impeller type of water pump situated in the outlet passage from the cylinder jacket. It may be assumed that the pump is driven, together with the fan, by means of a belt, but the fan need not be shewn.

[100 marks.]

9. Draw a longitudinal section through the rear crank-shaft bearing of a six-cylinder engine, 65 mm. bore and 102 mm. stroke, fitted with a four-bearing crank. Shew the method of attaching the flywheel to the shaft, and the shaft itself, in elevation, as far as the centre line of No. 6 cylinder.

[100 marks.]