THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATION COUNCIL OF TANZANIA

DIPLOMA IN TECHNICAL EDUCATION EXAMINATION

790 AUTOMOBILE TECHNOLOGY

Time: 3 Hour. **Monday, 08th May 2018 p.m.**

Instructions

1. This paper consists of **eight (8)** questions.
2. Answer any **five (5)** questions
3. Each question carries **twenty (20)** marks.
4. Programmable calculators, cellular phones and other unauthorized materials are **not** allowed in the examination room.
5. Write your **Examination Number** on every page of your answer booklet(s).

1. (a) Explain five safety precautions a technician must observe when repairing hydraulic brake systems in a vehicle workshop.

   (b) State three safety precautions to consider when using each of the following tools:

   (i) Hammer

   (ii) Bench vice

   (iii) Hacksaw

   (c) Sketch and label three different chassis frame types used in vehicle construction.

2. (a) (i) Define a reamer and state its purpose in engine servicing.

   (ii) Name four common types of reamers used in automotive workshops.

   (iii) Describe the use of a micrometer screw gauge in engine part measurement.

   (b) (i) What is engine backfiring in fuel systems?

   (ii) List four causes of backfiring in a fuel system.

   (c) Explain the purpose of adjusting steering geometry and describe how each of the following angles is corrected:

   (i) Camber angle

   (ii) Castor angle

   (iii) Toe-out angle

3. (a) Define the term “automotive engine” and explain its function in vehicle operation.

   (b) Distinguish between two-stroke and four-stroke internal combustion engines. Give two examples for each.

   (c) Explain how engine displacement (in cubic centimeters) is calculated and its relevance in vehicle tax rating.

   (d) Briefly describe the steps followed during injector testing using:

   (i) Visual spray test

   (ii) Leak-off test

   (iii) Pressure build-up test

4. (a) A four-cylinder inline engine follows a 1-3-4-2 firing order. Complete the following table by assigning the correct strokes for each cylinder:

Cylinder No: 1 2 3 4

1st Stroke: P I C E

2nd Stroke: E C I P

3rd Stroke: I P E C

4th Stroke: C E P I

P = Power stroke, C = Compression stroke, E = Exhaust stroke, I = Induction stroke

(b) Explain how the intake stroke occurs in a spark ignition engine.

(c) Identify four physical differences between petrol and diesel engines.

5. (a) State four advantages of diesel engines over petrol engines for commercial vehicles.

(b) A diesel engine produces 110 Nm torque at 1800 rpm. The drive passes through a gearbox with a gear ratio of 4:1. If the transmission efficiency is 92%, calculate:

(i) The torque at the output shaft

(ii) The output speed of the shaft

(c) State four essential properties required of a good engine coolant.

6. (a) Explain why pinion and crown wheel adjustments are necessary in a differential unit.

(b) (i) What is the function of the clutch release bearing?

(ii) Describe how the release bearing operates when the clutch pedal is depressed.

(iii) Explain the path of torque from the flywheel to the transmission input shaft.

(iv) What is the effect if the release bearing remains free during operation?

(c) Outline five essential properties required for clutch friction plate linings.

(d) (i) Identify the usual thermostat location in a car cooling system.

(ii) Describe a simple method for testing thermostat functionality.

7. (a) State four major functions performed by the front axle in a vehicle.

(b) (i) Describe the construction and working principle of the rack and pinion steering system.

(ii) State three functions of a delivery valve in a fuel injection system.

(c) The following parts were removed during engine dismantling of a 4-cylinder engine. Tabulate their costs:

Overhaul kit – 260,000

Main bearings – 27,000

Connecting rod bearings – 23,000

Camshaft bearings – 13,000 × 4 = 52,000

Piston rings – 70,000

Inlet valves – 16,000 × 4 = 64,000

Exhaust valves – 17,000 × 4 = 68,000

Rocker shaft – 22,000

Crankshaft sleeve – 53,000

Thrust bearings – 26,000 × 2 = 52,000

Total cost = ?

8. (a) Describe the effect of the following on a leaf spring system:

(i) Cracked bushings

(ii) Broken centre bolt

(iii) Loose U-bolts

(iv) Broken spring leaf

(b) (i) Outline five causes of pre-ignition in internal combustion engines.

(ii) How is a condenser tested for functionality?

(c) Explain the general procedure for setting ignition timing in a petrol engine manually.