THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATION COUNCIL OF TANZANIA

DIPLOMA IN TECHNICAL EDUCATION EXAMINATION

790 **AUTOMOBILE TECHNOLOGY**

Time: 3 Hour. **Monday, 11th May 2010 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) Outline five essential safety procedures a technician should follow before and during the removal of a manual gearbox from a vehicle.

(b) Explain the workshop-specific safety considerations when operating the following equipment:

(i) Engine analyzer

(ii) Hydraulic jack

(iii) Brake bleeding machine

(c) Sketch and label three types of vehicle chassis structures, indicating their typical applications.

2. (a) (i) Define the term “bushing reaming” and state its role during reconditioning of suspension components.

(ii) Identify four precision tools used in timing gear alignment and explain their functions.

(iii) What is a torque angle gauge and how is it applied in engine assembly?

(b) (i) What is “fuel injector pulse width”?

(ii) State four factors that affect pulse width in a multi-point fuel injection system.

(c) Describe inspection and adjustment methods for the following steering system conditions:

(i) Excessive play in steering wheel

(ii) Pulling to one side during braking

(iii) Off-center steering wheel

3. (a) Define a “stratified charge engine” and explain two ways in which it improves combustion efficiency.

(b) Compare three technical features of overhead valve (OHV) engines and overhead camshaft (OHC) engines.

(c) Describe a workshop method for checking cylinder head flatness using appropriate tools.

(d) Describe how to test each of the following injector faults:

(i) Leaking injector tip

(ii) Clogged injector

(iii) Weak solenoid

4. (a) A four-cylinder petrol engine has a firing order of 1-4-3-2. Assuming cylinders move in pairs (1–4 and 2–3), fill in the strokes for each cylinder.

Use: P – power, C – compression, I – induction, E – exhaust

(b) Explain what occurs during the compression stroke in a petrol engine in terms of piston movement and valve positions.

(c) State four functional disadvantages of using a two-stroke engine in highway vehicles.

5. (a) List four key differences in the lubrication systems of diesel and petrol engines.

(b) A 4-cylinder engine produces 100 Nm of torque at 3600 rpm. It drives a gearbox with a reduction ratio of 3.5:1 and efficiency of 89%. Calculate:

(i) Output torque at the gearbox

(ii) Rotational speed at the output shaft

(c) Explain four physical and chemical properties that make a good transmission fluid.

6. (a) Explain the effects of incorrect backlash adjustment in the differential assembly of a rear-wheel-drive vehicle.

(b) (i) What is the function of the clutch diaphragm spring?

(ii) Explain how clutch drag occurs and its effect on shifting.

(iii) List two causes of hard clutch pedal feel.

(iv) State two effects of a damaged clutch release bearing.

(c) Mention five factors to consider when selecting friction material for heavy-duty clutch systems.

(d) (i) Where is the coolant temperature sending unit located in an engine?

(ii) How does the coolant temperature affect ECU-controlled fuel injection?

7. (a) State four functions of a non-driven front axle in a two-wheel-drive vehicle.

(b) (i) Describe the basic function of a power steering pump.

(ii) Give three symptoms of a failing power steering pump.

(c) Calculate the estimated cost of overhauling a 4-cylinder petrol engine using the data below:

Engine gasket kit – 195,000/=

Main bearings – 45,000/=

Big end bearings – 32,000/=

Piston rings (4 pcs) – 68,000/= each

Intake valves (4 pcs) – 12,500/= each

Exhaust valves (4 pcs) – 14,000/= each

Oil seal set – 22,000/=

8. (a) Describe the suspension and handling effects of each of the following defects:

(i) Loose upper control arm

(ii) Damaged ball joint

(iii) Weak coil spring

(iv) Broken stabilizer link

(b) (i) Mention five causes of engine backfiring.

(ii) Explain how to test ignition coil resistance using a multimeter.

(c) Describe the procedure for aligning ignition timing on a distributor-less ignition system using a scan tool.