THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATION COUNCIL OF TANZANIA

DIPLOMA IN TECHNICAL EDUCATION EXAMINATION

790 **AUTOMOBILE TECHNOLOGY**

Time: 3 Hour. **Tuesday, 12 May 2009 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) Describe five safety measures that must be taken when handling electric and hybrid vehicle systems in a service workshop.

(b) Explain the workshop precautions for each of the following equipment:

(i) Engine hoist

(ii) Wheel alignment machine

(iii) Spark plug tester

(c) Sketch and label three types of load-bearing vehicle body structures used in light-duty vehicles.

2. (a) (i) Explain the term “honing” and its application during cylinder reconditioning.

(ii) List four precision measuring tools used in crankshaft and connecting rod inspection.

(iii) What is the purpose of a straight edge and feeler gauge during cylinder head inspection?

(b) (i) Define the term “air lock” in a fuel delivery system.

(ii) Give four consequences of air lock in high-pressure fuel systems.

(c) Explain the process of inspecting and correcting the following suspension geometry faults:

(i) Uneven camber

(ii) Rear axle misalignment

(iii) Ride height imbalance

3. (a) Define a dual-fuel engine and give two advantages of its use in modern heavy-duty vehicles.

(b) Compare electronic fuel injection and carburetor systems by giving three points of contrast in operation and efficiency.

(c) Describe a standard workshop procedure for checking valve clearance in a four-cylinder petrol engine.

(d) Explain how to test and diagnose performance of diesel fuel injectors using:

(i) Pop tester

(ii) Spray pattern test

(iii) Return flow measurement

4. (a) A four-cylinder engine operates on the firing order 1-2-3-4. Complete the cycle table showing strokes for each cylinder assuming 1–4 and 2–3 move together.

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

(b) Describe the piston movement and valve actions during the power stroke in a diesel engine.

(c) Outline four performance disadvantages of using a two-stroke engine in modern automotive applications.

5. (a) Outline four differences in the ignition systems of petrol and diesel engines.

(b) An engine produces 95 Nm torque at 3000 rpm and uses a 4.2:1 reduction gearbox with 88% efficiency. Calculate:

(i) Output torque

(ii) Final drive rotational speed

(c) List four chemical and physical properties of a good brake fluid and explain the significance of each.

6. (a) Explain the importance of correct preload adjustment on tapered roller bearings used in differential assemblies.

(b) (i) What is the clutch pressure plate and what role does it play in clutch operation?

(ii) Describe how clutch pedal movement disengages the drive.

(iii) What are the signs and causes of clutch slipping?

(iv) State two effects of a worn clutch disc on vehicle performance.

(c) Mention five desirable properties of materials used in clutch facings.

(d) (i) Where is the thermostat housing typically located in a vehicle engine?

(ii) Explain how to verify if a thermostat is opening at its rated temperature.

7. (a) State four major functions of a dead front axle in commercial vehicles.

(b) (i) Describe the operation of a recirculating ball steering gear.

(ii) List three symptoms of a worn steering gear mechanism.

(c) Using the following prices, calculate the total engine overhaul cost for a 6-cylinder inline diesel engine:

Engine kit – 310,000/=

Piston ring sets (6 pcs) – 70,000/= each

Main bearing sets (3 sets) – 33,000/= each

Big end bearing sets (6 pcs) – 27,000/= each

Valve seats (12 pcs) – 7,500/= each

Oil filter – 15,000/=

Head gasket – 24,000/=

8. (a) Explain how the following faults affect the suspension system and vehicle handling:

(i) Loose shock absorber mounting

(ii) Broken spring leaf

(iii) Bent suspension arm

(iv) Cracked stabilizer bush

(b) (i) Give five possible causes of misfiring in a petrol engine.

(ii) How can a digital multimeter be used to test a crankshaft position sensor?

(c) Describe how to perform ignition timing adjustment on an overhead camshaft engine fitted with a distributor.