THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATION COUNCIL OF TANZANIA

DIPLOMA IN TECHNICAL EDUCATION EXAMINATION

790 AUTOMOBILE TECHNOLOGY

Time: 3 Hour. **Monday, 08th May 2012 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 precautions that should be taken during the removal and refitting of engine components in an automotive workshop.

   (b) What precautions must be observed when working with each of the following tools?

   (i) Torque wrench

   (ii) Pneumatic wrench

   (iii) Screwdriver

   (c) Sketch and label three types of commonly used vehicle chassis layout.

2. (a) (i) What is the function of a micrometer in an automotive workshop?

   (ii) Mention four types of micrometers and indicate the use of each.

   (iii) State the importance of using a vernier caliper during mechanical measurements.

   (b) (i) What is meant by backfiring in a petrol engine?

   (ii) Identify four possible causes of backfiring through the intake manifold.

   (c) Explain the purpose of steering dampers and briefly describe how each of the following factors affect steering performance:

   (i) Steering play

   (ii) Steering column angle

   (iii) Wheel balance

3. (a) Define the term “piston displacement” as applied in internal combustion engines.

   (b) Differentiate between bore and stroke and explain their importance in engine design.

   (c) Explain three advantages of using overhead camshaft (OHC) engines over pushrod engines.

   (d) Describe how to perform a cylinder leakage test and interpret its findings.

4. (a) An inline four-cylinder engine with firing order 1-3-4-2 is operating under four-stroke cycle. Complete the stroke table to show piston activity at a given moment.

   (b) Describe the compression stroke in a diesel engine and state its importance in the power cycle.

   (c) State four differences between an air-cooled engine and a water-cooled engine.

5. (a) List four differences in operation between petrol and gas (LPG) engines.

   (b) An engine delivers 105 Nm torque at 4000 rpm. Calculate the power output in kilowatts.

   (c) Outline four essential characteristics of a good coolant in an automotive cooling system.

6. (a) Why is backlash necessary between gears in a final drive system?

   (b) (i) What is a centrifugal clutch?

   (ii) Describe how it engages and disengages during vehicle operation.

   (iii) What are the signs of a worn clutch disc?

   (iv) What causes clutch judder during acceleration?

   (c) List five essential properties of an ideal brake fluid.

   (d) (i) Where is the thermostat installed in a vehicle's cooling system?

   (ii) Explain the function of the thermostat during engine warm-up and normal operation.

7. (a) State four purposes of using an independent front suspension system.

   (b) (i) Explain the working principle of a worm and roller steering box.

   (ii) Mention three roles of the oil filter in an internal combustion engine.

   (c) Calculate the total cost of engine servicing with the following spare parts:

   Gasket set – Tsh. 145,000

   Connecting rod bush – Tsh. 9,000 × 4

   Valve springs – Tsh. 5,000 × 8

   Timing chain – Tsh. 48,000

   Cylinder head bolts – Tsh. 6,500 × 10

   Fan belt – Tsh. 24,000

8. (a) State the effect of the following conditions on shock absorber performance:

   (i) Oil leakage

   (ii) Bent piston rod

   (iii) Broken mounting bush

   (iv) Air entrapment

   (b) (i) Identify five reasons that may cause engine misfiring.

(ii) Describe the method of testing spark plugs for proper function.

(c) Explain the ignition timing adjustment process using a distributor and timing marks.