THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATION COUNCIL OF TANZANIA

DIPLOMA IN TECHNICAL EDUCATION EXAMINATION

790 **AUTOMOBILE TECHNOLOGY**

Time: 3 Hour. **Monday, 12th May 2015 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 major causes that can lead to low engine oil pressure during vehicle operation.

   (b) Describe the step-by-step procedure followed when replacing a timing belt in a four-cylinder overhead camshaft engine.

   (c) Identify three types of oil pumps used in internal combustion engines and explain one advantage of each.

2. (a) (i) What is the function of a knock sensor in a modern petrol engine?

   (ii) Mention four signs that indicate a knock sensor is faulty.

   (iii) How does the ECU adjust engine operation based on input from the knock sensor?

   (b) (i) Differentiate between open-loop and closed-loop fuel control systems used in electronic fuel injection.

   (ii) Explain two reasons why closed-loop systems are preferred over open-loop systems in modern vehicles.

   (c) Sketch and explain a cross-flow cylinder head design, stating its advantages in combustion efficiency and engine performance.

3. (a) List five possible causes of continuous white smoke emission from the exhaust pipe of a petrol engine.

   (b) Explain the correct method for performing a battery load test and how to interpret the test results.

   (c) What is engine hesitation and what are three common faults that may lead to this problem during acceleration?

   (d) Describe how the electronic throttle control system works and how it differs from the mechanical throttle system.

4. (a) Identify and explain four engine-related faults that may lead to increased hydrocarbon (HC) emissions from a petrol engine.

   (b) Describe the procedure for conducting a vacuum test on a petrol engine and explain what high, low, or fluctuating readings indicate about engine condition.

   (c) Explain the importance of correct firing order in a four-cylinder engine and how wrong firing order affects engine operation.

5. (a) List four main functions of a cooling fan in an internal combustion engine.

   (b) A V6 engine has a bore of 92 mm and a stroke of 88 mm. Calculate its total displacement in liters.

(c) Mention four negative effects of running an engine at excessively high temperatures for prolonged periods.

6. (a) Describe the construction and working principle of a MacPherson strut suspension system.

   (b) Explain the difference between positive and negative camber and their specific effects on vehicle handling and tyre wear.

   (c) State three possible causes of uneven tyre wear and explain the consequences of each.

7. (a) Mention four advantages of using a transaxle in front-wheel-drive vehicles.

   (b) Explain the working principle of a synchronizer unit in a manual transmission system.

   (c) An engine produces 180 Nm of torque at 4000 rpm. If the gearbox has a gear ratio of 3.5:1 and an efficiency of 90%, calculate the torque and output speed at the driveshaft.

8. (a) List four symptoms that may indicate a restricted exhaust system in a vehicle.

   (b) Describe the procedure of performing an exhaust backpressure test and explain how to interpret the results.

   (c) Identify four sources of abnormal engine noise and explain how each can be diagnosed effectively.