

Automotive Electrical and Engine Performance 8th Edition

Chapter 20 – Fuel Trim Diagnosis

Quiz A

1. What is the purpose of fuel trim in an engine management system?
 - a. To adjust the air–fuel mixture based on oxygen sensor feedback
 - b. To regulate engine coolant temperature
 - c. To control throttle position during deceleration
 - d. To measure engine RPM and fuel pressure

2. How does the Powertrain Control Module (PCM) determine the base pulse width for fuel injectors?
 - a. Using sensor data from RPM, MAP, BARO, and TPS before oxygen sensor feedback
 - b. By directly measuring the air–fuel mixture using oxygen sensors
 - c. By calculating throttle response and EGR flow rate
 - d. Through manual adjustment based on engine displacement

3. What is indicated by a lambda value of 0.9?
 - a. The engine is operating with a stoichiometric air–fuel mixture
 - b. The engine is running lean with higher NO_x emissions
 - c. The engine is running rich, with an air–fuel ratio of approximately 13.2:1
 - d. The engine has excessive exhaust back pressure

4. Which sensor is critical for determining the mass of air entering the engine in a MAF-based system?
 - a. Throttle position sensor (TPS)
 - b. Manifold absolute pressure (MAP) sensor
 - c. Mass airflow (MAF) sensor
 - d. Oxygen (O₂) sensor

5. What condition is likely to result in a positive long-term fuel trim (LTFT) reading?
- a. A rich exhaust mixture
 - b. A vacuum leak causing a lean mixture
 - c. A faulty ignition coil
 - d. A clogged catalytic converter
6. What is the primary advantage of using a mass airflow (MAF) sensor over a speed density system?
- a. It eliminates the need for throttle position sensor data
 - b. It provides direct measurement of air entering the engine for more accurate fueling
 - c. It improves engine performance by varying injector pulse width dynamically
 - d. It reduces the likelihood of false air entering the intake manifold
7. What happens to the injector pulse width if the PCM detects low battery voltage?
- a. The PCM reduces the pulse width to conserve power
 - b. The PCM increases the pulse width to ensure adequate fuel delivery
 - c. The PCM switches to open-loop operation to protect the engine
 - d. The PCM disables fuel injectors to prevent engine damage
8. Why are both short-term fuel trim (STFT) and long-term fuel trim (LTFT) necessary?
- a. To improve engine idle stability under varying load conditions
 - b. To provide quick adjustments and long-term corrections for air–fuel mixture
 - c. To adjust spark timing based on RPM fluctuations
 - d. To diagnose catalytic converter efficiency
9. What is a key factor that affects the volumetric efficiency (VE) of an engine?
- a. Exhaust back pressure caused by a restricted catalytic converter
 - b. Oxygen sensor calibration at wide-open throttle
 - c. Ambient air pressure at sea level
 - d. Battery voltage corrections during high-load conditions

10. What is the typical stoichiometric air–fuel ratio for gasoline engines?

a. 14.7:1

b. 13.2:1

c. 16.9:1

d. 12.5:1

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Correct Answers:

1. a

2. b

3. d

4. c

5. b

6. b

7. d

8. a

9. b

10. d