Automotive Electrical and Engine Performance 9th Edition
Chapter 19 – Narrow and Wide-Band Oxygen Sensors
Quiz A

1. What is the primary purpose of a wide-band oxygen sensor?

a. To provide a broader range of air–fuel ratio detection for precise engine control

b. To detect and prevent catalytic converter overheating

c. To measure exhaust gas recirculation (EGR) levels in real-time

d. To control engine temperature during high-speed operation

2. How does a zirconia oxygen sensor generate a voltage signal?

a. By measuring differences in air density between intake and exhaust

b. By comparing oxygen levels in exhaust gases and ambient air

c. By detecting pressure variations in the exhaust manifold

d. By using a strain gauge to monitor exhaust gas composition

3. What condition is indicated by a high oxygen sensor voltage (above 800 mV)?

a. Lean air–fuel mixture (high oxygen in exhaust)

b. Engine overheating due to low coolant levels

c. Rich air–fuel mixture (low oxygen in exhaust)

d. Catalytic converter efficiency failure

4. Why are heated oxygen sensors (HO2S) used in modern vehicles?

a. To reduce emissions during engine startup by quickly reaching operating temperature

b. To ensure more accurate readings during long idle periods

c. To improve sensor durability in high-temperature environments

d. To eliminate the need for pre-heated intake air

5. What is the expected voltage range of a properly functioning narrow-band oxygen sensor?

a. 0.3–0.5 volts

b. 0.1–1.0 volts

c. 0.5–1.2 volts

d. 0.8–2.0 volts

6. What is a common cause of a false rich condition in oxygen sensor readings?

a. Vacuum leaks in the intake manifold

b. Contaminated or fouled oxygen sensor

c. Excessive fuel injector pulse width

d. Ground connection failure

7. What advantage does a planar design offer for oxygen sensors?

a. Faster warm-up time due to efficient heating

b. Resistance to high exhaust pressures

c. Greater compatibility with lean-burn engines

d. Improved detection of unburned hydrocarbons

8. What role does the PCM play in oxygen sensor diagnostics?

a. It adjusts injector timing based on exhaust composition

b. It compares upstream and downstream sensor signals for catalytic converter efficiency

c. It regulates spark timing to match oxygen sensor outputs

d. It measures exhaust gas temperature using the oxygen sensor

9. Which of the following is a symptom of a malfunctioning oxygen sensor?

a. Decreased engine vacuum pressure

b. Excessive ignition timing advance

c. Unstable idle and reduced fuel economy

d. Increased cylinder head temperature

10. What is the typical operating temperature range for a wide-band oxygen sensor?

a. 800°F–1,000°F (427°C–538°C)

b. 1,200°F–1,400°F (650°C–760°C)

c. 600°F–800°F (315°C–427°C)

d. 1,500°F–1,800°F (815°C–982°C)

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Correct Answers:

1. a

2. b

3. c

4. a

5. b

6. d

7. a

8. b

9. c

10. b