A

Roll # _____ Name _____ Section _____

1. Which layer does LoRa define in the communication stack?

a) Network Layer

b) Transport Layer

c) Physical Radio Layer

d) Application Layer

2. A LoRaWAN application requires infrequent uplink messages from battery-powered sensors but needs the lowest possible latency for occasional downlink commands (e.g., immediate valve shut-off). Which device class is the most suitable choice?

a) Class A

b) Class B

c) Class C

d) Class A and B equally

3. What MAC protocol approach does LoRaWAN primarily use for uplink transmissions?

a) CSMA/CD

b) CSMA/CA

c) TDMA

d) ALOHA

4. Which of the following IPv6 address representations is valid abbreviations for 2001:0db8:0000:0000:1000:00ff:0000:abc0?

a) 2001:db8::1000:ff:0:abc0

b) 2001:db8:0:0:1000:ff::abc0

c) 2001:db8::1000:ff::abc0

d) 2001:db8::1:ff:0:abc

5. Which are the two main functions of the 6LoWPAN adaptation layer?

a) Routing and Security

b) Header Compression and Packet Fragmentation

c) Network Discovery and Address Assignment

d) Flow Control and Error Correction

6. How does 'mesh-under' routing differ from 'route-over' routing in a 6LoWPAN context? (Select ALL that apply)

a) Mesh-under makes forwarding decisions at the adaptation layer using link-layer addresses.

b) Route-over makes forwarding decisions at the network layer using IPv6 addresses.

c) Mesh-under requires the Mesh Addressing Header.

d) Route-over is only possible in star topologies.

7. While 6LoWPAN provides IPv6 connectivity over IEEE 802.15.4, it doesn't provide a complete, ready-to-use IoT network stack on its own. What essential components are typically added by higher-layer protocols or frameworks like Thread? (Select ALL that apply)

a) Physical layer modulation definition.

b) A specific routing protocol.

c) Network/device commissioning and management procedures.

d) MAC layer channel access rules.

8. The three main types of headers in the 6LoWPAN encapsulation header stack are: _____, _____, and _____.

a) Header Compression, Mesh, Application

b) IPv6, UDP, TCP

c) IP, MAC, Transport

d) Header Compression, Fragment, Mesh Addressing

9. Which standard does 6LoWPAN use at the physical and MAC layers?

a) IEEE 802.11

b) IEEE 802.15.1

c) IEEE 802.15.4

d) IEEE 802.3

10. The 'dispatch byte' in a 6LoWPAN header is used to:

a) Encrypt the message

b) Identify the IPv6 version

c) Identify the type of the header

d) Route the message through the mesh

Roll # _____ Name _____ Section _____

1. What is the typical topology of a LoRaWAN network?

a) Mesh

b) Star

c) Ring

d) **Star-of-stars**

2. What factor directly contributes to the long range achievable by LoRa technology?

b) Use of star-of-stars topology.

c) Operation in unlicensed bands.

d) **Very low data rates**

e) Adherence to the ALOHA MAC protocol.

3. Which part of an IPv6 address identifies the specific subnet?

a) Host ID

b) Interface ID

c) **Network ID**

d) Flow Label

4. Which IPv4 header field was removed in the main IPv6 header?

a) Source Address

b) Destination Address

c) **Checksum**

d) Version

5. An IPv6 packet needs to traverse a path with MTU of 1300 bytes. The original packet consists of a 40-byte base header, a 20-byte Hop-by-Hop options header (processed by all routers), a 60-byte fragmentable routing header, and 1280 bytes of upper-layer data. Will fragmentation be required by source, and why?

a) No, because the data size (1280) is less than the path MTU.

b) **Yes, because the total packet size exceeds the path MTU.**

c) No, because IPv6 routers fragment packets automatically if needed.

d) Yes, because the routing header and data combined (1340) is more than path MTU.

6. Why will simple adoption of standard IPv6 (without 6LoWPAN) be problematic over IEEE 802.15.4 networks?

a) IPv6 addresses are too long to fit in an 802.15.4 frame.

b) IEEE 802.15.4 does not support the necessary transport protocols (TCP/UDP).

c) The minimum MTU required by IPv6 far exceeds the maximum frame size of 802.15.4.

d) IPv6 does not inherently support mesh networking.

7. The adaptation layer of 6LoWPAN is inserted as a sublayer within which OSI layer?

a) Physical

b) Data Link

c) Network

d) Application

8. Which protocol stack was developed to fill the gaps left by 6LoWPAN and IEEE 802.15.4?

a) MQTT

b) Thread

c) Bluetooth

d) Zigbee

9. In 6LoWPAN mesh routing, what is the difference between 'mesh-under' and 'route-over'?

a) Mesh-under uses Layer 3 addresses; Route-over uses Layer 2 addresses.

b) Mesh-under uses link-layer addresses for forwarding; Route-over uses network-layer (IPv6) addresses

c) Mesh-under is for star topologies; Route-over is for mesh.

d) Mesh-under is less efficient than route-over.

10. A 6LoWPAN border router performs several critical functions. Which of the following is NOT typically a primary role of the border router?

a) Compressing/decompressing IPv6 headers for traffic entering/leaving the 6LoWPAN.

b) Acting as the primary data storage server for all sensor readings.

c) Relaying data between the 6LoWPAN and the wider Internet/backend network.

d) Potentially initiating and managing the 6LoWPAN network.