Quiz 2

- Due Jun 11 at 12:15p.m.
- Points 30
- Questions 30
- Available Jun 11 at 11:45a.m. - Jun 11 at 12:15p.m. 30 minutes
- Time Limit 30 Minutes

Attempt History

	Attempt	Time	Score
LATEST	**Attempt 1**	18 minutes	30 out of 30

Score for this quiz: 30 out of 30
Submitted Jun 11 at 12:03p.m.
This attempt took 18 minutes.

⸬

Question 1
1 / 1 pts

Which specific feature of IEC 61850-9-2 makes it suitable for Process Bus applications in digital substations?

Correct!

◉ Sampled Value transmission for analog measurements

○ Support for HTTP transmission

○ Encryption of SCADA commands

○ Integration with GPS time

⸬

Question 2
1 / 1 pts

In the context of PMUs, what is the primary reason for using recursive DFT algorithms over non-recursive ones?

○ They require fewer input parameters

○ They improve GPS synchronization

Correct!

◉ They allow efficient computation using overlapping samples

○ They are easier to implement

⸬

Question 3
1 / 1 pts

Which IEEE standard amendment introduced modifications to PMU performance under dynamic conditions?

○ IEEE 1344-1995

○ IEEE C37.118.2-2011

○ IEEE 61850-9-2

Correct!

◉ IEEE C37.118.1a-2014

Question 4

1 / 1 pts

What does the Fraction-of-Second Count (FRACSEC) indicate in synchrophasor time tagging?

○ Accuracy of phase angle

○ UTC leap second adjustment

Correct!

◉ Fractional part of the second in the timestamp

○ Total seconds since 1970

Question 5

1 / 1 pts

Why is Total Vector Error (TVE) a critical metric in synchrophasor systems?

Correct!

◉ It quantifies the accuracy of phasor estimation against a reference

○ It calculates reactive power

○ It monitors harmonic content

○ It measures voltage distortion

Question 6

1 / 1 pts

What distinguishes IEC 61850-8-1 (GOOSE) from traditional SCADA messaging?

Correct!

◉ It enables peer-to-peer communication with low latency

○ It uses XML encoding

○ It is only used for billing data

○ It operates over serial links

Question 7

1 / 1 pts

How does SCADA's 'Select-Before-Operate' (SBO) function enhance operational safety?

Correct!

⊙ By requiring confirmation before execution

○ By encrypting all commands

○ By blocking remote access

○ By logging operator actions automatically

⋮⋮

Question 8

1 / 1 pts

What role do precision time protocols play in synchrophasor measurements?

○ They prevent cyberattacks

○ They compress the data stream

○ They format messages in XML

Correct!

⊙ They align time-stamps across devices with high accuracy

⋮⋮

Question 9

1 / 1 pts

Which advantage does the IEC 61850 Process Bus offer over traditional wiring?

Correct!

⊙ Simplified wiring and improved signal fidelity

○ Increased copper usage

○ Cheaper transformers

○ Reduced voltage fluctuations

⋮⋮

Question 10

1 / 1 pts

What is the impact of out-of-band interference on synchrophasor measurements?

○ Increases voltage levels

○ Leads to data frame errors

○ Boosts accuracy of phasors

Correct!

⊙ Causes aliasing in sampled data

⋮⋮

Question 11

1 / 1 pts

What is the primary purpose of the Configuration Message in IEEE C37.118.2?

○ To store phasor logs

Correct!

◉ To describe the synchrophasor data stream structure

○ To encrypt PMU data

○ To initiate command messages

Question 12

1 / 1 pts

Why are recursive DFT algorithms suitable for real-time applications?

○ They use higher sampling rates

○ They support multiple data formats

Correct!

◉ They reuse prior calculations to save processing time

○ They are more accurate

Question 13

1 / 1 pts

Which key parameter indicates voltage stability margin in synchrophasor analytics?

Correct!

◉ Voltage Phase Angle Difference

○ Reactive Power Flow

○ Tap Position

○ Total Harmonic Distortion

Question 14

1 / 1 pts

What does the SOC (Second-of-Century) field represent in PMU time tags?

○ Cumulative leap seconds

○ Synchrophasor accuracy index

Correct!

◉ Seconds since 1970-01-01 UTC

○ Time drift correction

Question 15

1 / 1 pts

Which automated scheme prevents voltage collapse during large disturbances?

○ Automatic Reclosing

○ Bus Transfer Logic

Correct!

◉ Under-Frequency Load Shedding

○ Auto-synchronizing

Question 16

1 / 1 pts

What is a key benefit of non-conventional CTs in high-fidelity digital substations?

Correct!

◉ Smaller physical footprint and no saturation

○ Support for analog relays

○ Better electromagnetic coupling

○ High thermal stability

Question 17

1 / 1 pts

Which IEEE standard defines the accuracy requirements for dynamic synchrophasors?

○ IEEE 1344

○ IEEE 519

○ IEC 60870

Correct!

◉ IEEE C37.118.1a-2014

Question 18

1 / 1 pts

Why is GOOSE messaging preferred for time-critical protection signaling?

○ Fixed packet size

Correct!

◉ Low latency multicast capability

○ Error correction protocols

○ High bandwidth

Question 19

1 / 1 pts

Which power system state estimation benefit is provided by PMU deployment?

○   Removes all relay settings

○   Replaces circuit breakers

Correct!

◉   Provides faster and linear estimation algorithms

○   Eliminates need for voltage regulation

Question 20

1 / 1 pts

In synchrophasor estimation, what does the phase angle Φ represent?

○   Magnitude of current

Correct!

◉   Offset from time axis of waveform

○   Shift from GPS signal

○   Amplitude modulation

Question 21

1 / 1 pts

What characteristic of IEDs enables distributed substation automation?

Correct!

◉   Programmable logic and communication

○   Low signal noise

○   Battery backup

○   High resistance

Question 22

1 / 1 pts

Why is time synchronization critical for synchrophasor comparison across devices?

○   To verify power factor

○   To match waveform colors

Correct!

◉   To ensure simultaneous phasor measurement

○   To reset PMUs

Question 23

1 / 1 pts

How does voltage instability prediction benefit from synchrophasor data?

Correct!

○ By assessing proximity to voltage collapse

○ By calculating frequency deviation

○ By enabling dynamic relay resetting

○ By reducing harmonics

Question 24

1 / 1 pts

What do Sampled Values (SV) packets primarily contain?

○ Device metadata

Correct!

● Time-stamped voltage and current samples

○ Digital breaker statuses

○ SCADA setpoints

Question 25

1 / 1 pts

Which communication redundancy protocol ensures seamless failover in substations?

Correct!

● PRP

○ NTP

○ RSTP

○ DNP3

Question 26

1 / 1 pts

What does the Precision Time Protocol (PTP) provide that NTP cannot in substation automation?

○ Legacy system support

○ Wider device compatibility

Correct!

● Sub-microsecond synchronization over Ethernet

○ Support for analog signal tagging

Question 27

1 / 1 pts

Which component in a digital substation digitizes analog inputs close to the primary equipment?

○ IED Controller

○ RTU

Correct!

◉ Merging Unit

○ GOOSE relay

⋮⋮

Question 28   1 / 1 pts

Which IEC standard governs inter-device messaging like GOOSE and Sampled Values?

○ IEEE C37.118

○ IEC 60870-5-101

○ NIST SP 800-82

Correct!

◉ IEC 61850

⋮⋮

Question 29   1 / 1 pts

Why is the concept of 'Total Vector Error' (TVE) crucial in PMU compliance testing?

○ It indicates the presence of harmonics

○ It measures equipment wear

○ It evaluates voltage drop across transformers

Correct!

◉ It quantifies deviation from an ideal phasor under test conditions

⋮⋮

Question 30   1 / 1 pts

How do phasor measurement units (PMUs) contribute to wide-area monitoring systems (WAMS)?

Correct!

◉ By enabling synchronized, high-speed measurements across vast grids

○ By replacing traditional relays

○ By controlling load frequency

○ By reducing generator trips

Quiz Score: 30 out of 30