Cosmic Computational Systems

Computer Science · Answer Key · 15 Questions

1. Which radiation-hardened microprocessor, based on the RAD750 architecture, powered the Curiosity rover to perform complex autonomous navigation on Mars?

A) PowerPC 750FX
B) Intel Pentium III
C) ARM Cortex-A9
D) MIPS R3000

2. What is the primary purpose of the 'Deep Space Network' (DSN) in the context of signal processing and data transmission?

A) Inter-planetary cloud storage
B) Ground-based antenna array for satellite communication
C) Quantum encryption for space shuttles
D) Autonomous atmospheric cleaning

3. In the context of the James Webb Space Telescope, what software architecture manages the complex wavefront sensing and control algorithms?

A) Real-Time Operating System (RTOS)
B) Distributed Ledger Technology
C) Fuzzy Logic Neural Network
D) Legacy COBOL Mainframe

4. The 'Mars Reconnaissance Orbiter' utilizes what specific type of data compression to handle high-resolution image telemetry back to Earth?

A) Huffman coding
B) Lossless Rice compression
C) Block Truncation Coding
D) Run-length encoding

5. Which algorithm is standardly used by the Chandra X-ray Observatory to perform image reconstruction from raw photon counts?

A) Richardson-Lucy deconvolution
B) Bubble Sort
C) K-Means Clustering
D) Linear Regression

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6. What computational challenge does the 'Gaia' mission's data processing pipeline primarily solve regarding celestial mechanics?

A) Astrometric global solution for one billion stars
B) Generating 3D fractal terrains
C) Real-time trajectory modification
D) Blockchain-based orbit verification

7. What is the significance of 'Reed-Solomon' error correction coding in the context of the Voyager spacecraft's long-distance telemetry?

A) It encrypts user data
B) It corrects bit errors induced by cosmic ray interference
C) It compresses video streams
D) It synchronizes clock cycles across galaxies

8. Which programming language is predominantly used in NASA's Flight Software Systems for deep space missions due to its predictability and memory safety?

A) Python
B) C++ (with MISRA standards)
C) Rust
D) JavaScript

9. What role does the 'SETI@home' distributed computing project serve in astronomical data analysis?

A) Managing planetary orbits
B) Processing radio telescope data to detect narrow-band signals
C) Simulating dark matter distribution
D) Encrypting stellar coordinates

10. The Cassini spacecraft utilized a dual-redundant 'MIL-STD-1553' bus for which specific system function?

A) High-speed image processing
B) Command and data handling between subsystems
C) Nuclear power distribution
D) Propulsion fluid dynamics

11. Which statistical technique is frequently applied to analyze 'exoplanet transit' light curve data to filter out stellar noise?

A) Bayesian inference
B) Dynamic Programming
C) Quicksort
D) Depth-first search

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12. In space-based computing, what is the primary cause of 'Single Event Upsets' (SEUs) that necessitate specialized hardware designs?

A) Thermal throttling

B) High-energy particle strikes

C) Software memory leaks

D) Incorrect pointer references

13. What specific computational paradigm is used for 'Autonomous Sciencecraft' aboard the EO-1 satellite to detect volcanic activity?

A) On-board data analysis and event triggering

B) Neural network-based weather prediction

C) Blockchain-based security

D) Manual telemetry upload

14. Which protocol suite is the standard for space communications, developed by the Consultative Committee for Space Data Systems (CCSDS)?

A) TCP/IP

B) Space Packet Protocol

C) Bluetooth LE

D) HTTP/3

15. What is the main function of a 'Star Tracker' in the attitude control software of a spacecraft?

A) Predicting star death

B) Determining orientation via celestial pattern recognition

C) Calculating galactic drift

D) Measuring the speed of light

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