INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal-500043, Hyderabad

B.Tech VII SEMESTER END EXAMINATIONS (REGULAR) - AUGUST 2023
Regulation: UG-20
CYBER PYSICAL SYSTEMS

Time: 3 Hours   CSE (CYBER SECURITY)   Max Marks: 70

Answer ALL questions in Module I and II
Answer ONE out of two questions in Modules III, IV and V
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

MODULE – I

1. (a) Illustrate about the key design drivers that significantly influence the development of cyber-physical systems (CPS). [BL: Understand| CO: 1|Marks: 7]

   (b) Outline the quality attributes essential for effective CPS design. Provide a comprehensive analysis of these attributes and elucidate how they contribute to the overall reliability, safety, and efficiency of CPS. [BL: Understand| CO: 1|Marks: 7]

MODULE – II

2. (a) Describe finite state machines and discuss their applications in cyber-physical systems.
   [BL: Understand| CO: 2|Marks: 7]

   (b) Classify different classes of hybrid systems. Compare and contrast these classes based on their characteristics and applicability in real-world CPS.
   [BL: Understand| CO: 2|Marks: 7]

MODULE – III

3. (a) Discuss the fundamental concept of embedded systems. Explain how basic components of an embedded system differ from general-purpose computing systems?
   [BL: Understand| CO: 3|Marks: 7]

   (b) Mention the invariants in the context of embedded systems. Explain how invariants contribute to ensuring system correctness and stability? [BL: Understand| CO: 3|Marks: 7]

4. (a) Elucidate the concepts of equivalence and refinement in the context of developing models from specifications in embedded systems. [BL: Understand| CO: 4|Marks: 7]

   (b) Interpret how reachability analysis contributes to ensuring the absence of undesired states and behaviors in these systems. [BL: Understand| CO: 4|Marks: 7]

MODULE – IV

5. (a) How can sensitivity analysis be used to assess the robustness of models in the presence of uncertainty, and what strategies can be employed to mitigate the effects of uncertain parameters in system design and decision-making? [BL: Understand| CO: 5|Marks: 7]

(b) Conduct a sensitivity analysis of a continuous system model. Describe the process, key considerations, and the impact of parameter variations on system behavior.

[BL: Understand| CO: 5|Marks: 7]

6. (a) Investigate the challenges faced in scheduling tasks within embedded systems operating in real-time environments.

[BL: Understand| CO: 5|Marks: 7]

(b) Compare and contrast static and dynamic verification techniques for cyber-physical system models.

[BL: Understand| CO: 5|Marks: 7]

MODULE – V

7. (a) Explain the unique security challenges faced by industrial control systems (ICS) in comparison to traditional IT systems.

[BL: Understand| CO: 6|Marks: 7]

(b) Contrast the role and significance of model-based techniques in detecting integrity attacks on sensors within CPS.

[BL: Understand| CO: 6|Marks: 7]

8. (a) Relate and compare different countermeasures used to detect integrity attacks on sensors in CPS.

[BL: Understand| CO: 6|Marks: 7]

(b) Categorize the diverse applications of swarms of Unmanned Aerial Vehicles (UAVs) in enhancing cybersecurity or mitigating cyber threats.

[BL: Apply| CO: 6|Marks: 7]

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