

GUJARAT TECHNOLOGICAL UNIVERSITY

BE-6 SEMESTER – OLD PAPER – S22 TO W25 – QUESTION BANK

Subject Name & Code:

CYBER PHYSICAL SYSTEMS (3161011)

Unit 1: Introduction to Cyber-Physical Systems

Repeated Questions:

1. **What are basic principles of design and validation of CPS?**
(S24 - Q1a, 03 marks)
(S23 - Q3b, 04 marks)
(SUM25 - Q5a, 03 marks)
(S22 - Q4a, 03 marks)
2. **What is Industry 4.0? Explain it.**
(S24 - Q1c, 07 marks)
(SUM25 - Q3a, 03 marks)
(S22 - Q5a, 03 marks)
3. **What is IIOT implications? Explain it in detail.**
(S24 - Q1b, 04 marks)
(SUM25 - Q2b, 04 marks)
(S23 - Q4c, 07 marks)
(S22 - Q5b, 04 marks)
4. **How CPS used in Medical field?**
(SUM25 - Q1a, 03 marks)
(S22 - Q3a, 03 marks)

Other Important Questions (Chronologically: S24 → SUM25 → S23 → S22):

5. How Cyber Physical System used in Industry 4.0? (S24 - Q1c, 07 marks)
 6. Explain the Basic principles of CPS involved in medical application. (S24 - Q2c, 07 marks)
 7. Explain Industry 4.0 in detail. (SUM25 - Q3a, 03 marks)
 8. What is AutoSAR? Explain it in detail. (S22 - Q3b, 04 marks)
 9. Explain CPS application in Real world. (S22 - Q5a, 03 marks / SUM25 - Q5b, 04 marks)
 10. What is AutoSAR? Explain it in detail. (S23 - Q5c, 07 marks)
 11. Explain Wireless Hart in detail. (S22 - Q3a, 03 marks / SUM25 - Q5a, 03 marks)
 12. How CPS used in Building Automation. Explain in detail. (SUM25 - Q1c, 07 marks)
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Unit 2: CPS – Environment

Repeated Questions:

1. **How Human and CPS are connected each other? Explain it in detail.**
(S24 - Q2a, 03 marks)
(SUM25 - Q2a, 03 marks)
(S22 - Q4a, 03 marks)
2. **What is RTOS? Explain it in detail.**
(S24 - Q2b, 04 marks)
(SUM25 - Q1b, 04 marks)
(S23 - Q4b, 04 marks)
(S22 - Q5b, 04 marks)
3. **Explain Human Computer Interface (HCI) in detail.**
(S24 - Q4b, 04 marks)
(S23 - Q4a, 03 marks)
(S22 - Q4b, 04 marks)
4. **Explain CAN bus protocol in detail.**
(S24 - Q3a, 03 marks)
(SUM25 - Q3a, 03 marks)
(S22 - Q2a, 03 marks)

Other Important Questions (Chronologically: S24 → SUM25 → S23 → S22):

5. Differentiate Hard real time and soft real time in an embedded system. (S23 - Q1a, 03 marks)
 6. Differentiate I/O mapped I/O and Memory Mapped I/O. (S23 - Q2b, 04 marks)
 7. Explain various modes of communication protocol in Automotive domain. (S23 - Q3a, 03 marks)
 8. Differentiate tasks, threads and process. (S23 - Q4b, 04 marks)
 9. Write a note on two state process model. (S23 - Q5b, 04 marks)
 10. Explain various terminologies in reference to sensor selection for embedded application. (S23 - Q2c, 07 marks)
 11. List down the various hardware and software components of CPS and explain in detail. (S23 - Q4c, 07 marks)
 12. Explain low level Control model of CPS. (S23 - Q5a, 03 marks)
 13. Explain Scheduling Real Time control tasks in detail. (SUM25 - Q5b, 04 marks)
 14. List and explain any 2 Sensors used in CPS H/W. (SUM25 - Q4a, 03 marks)
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Unit 3: CPS Engineering

Repeated Questions:

1. **Explain Low level Control model of CPS.**
(S24 - Q3b, 04 marks)
(S23 - Q5a, 03 marks)
(S22 - Q3b, 04 marks)
2. **What are the effects of scheduling?**
(S24 - Q4a, 03 marks)
(SUM25 - Q4b, 04 marks)
(S22 - Q2b, 04 marks)
3. **Explain Sense and actuation faults of CPS system / on control performance.**
(S24 - Q4b, 04 marks)
(SUM25 - Q2c OR, 07 marks)
(S22 - Q1b, 04 marks)
4. **How network congestion affects CPS? / Write a note on Network congestion w.r.t. CPS / How is CPS impacted by network congestion?**
(S24 - Q2c OR, 07 marks)
(S23 - Q3c, 07 marks)
(S22 - Q2c OR, 07 marks)
5. **How Scheduling used in RTOS for Real Time control tasks.**
(S24 - Q4c, 07 marks)
(S22 - Q3c, 07 marks)

Other Important Questions (Chronologically: S24 → SUM25 → S23 → S22):

6. Why mapping of software components to ECUs is important in CPS engineering? (S24 - Q5a, 03 marks)
 7. What are the effects of bus latency in scheduling? (S23 - Q3b, 04 marks)
 8. Explain the various ways of memory allocation in RTOS. (S23 - Q2a, 03 marks)
 9. Write a note on scheduling in real time environment. (S23 - Q3a, 03 marks)
 10. Describe the sense and actuation errors in the CPS. (S24 - Q4b, 04 marks)
 11. How network congestion done in CPS engineering. (SUM25 - Q3b, 04 marks)
 12. Explain CPS Performance Analysis in detail. (SUM25 - Q3c, 07 marks)
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Unit 4: CPS Analysis and Verification

Repeated Questions:

1. **Explain Advanced Automata based modeling and analysis using an example.**
(S24 - Q3c, 07 marks)
(SUM25 - Q4c, 07 marks / Q5c, 07 marks)
(S23 - Q3c, 07 marks)
(S22 - Q2c, 07 marks)
2. **How Flowpipe construction using SpaceX and Phaver tools carried out.**
(SUM25 - Q4c, 07 marks)
(S22 - Q3c, 07 marks)
3. **How CPS SW be verified using Frama-C.**
(S24 - Q5c, 07 marks)
(SUM25 - Q4b, 04 marks)
(S22 - Q4c, 07 marks)

Other Important Questions (Chronologically: S24 → SUM25 → S23 → S22):

4. Write about the weakest preconditions in CPS software. (S24 - Q5b, 04 marks)
 5. Explain Automotive Ethernet in detail. (S24 - Q4c, 07 marks)
 6. Define the bus latency. (S24 - Q3a, 03 marks)
 7. What is bus latency? Explain it. (S22 - Q1a, 03 marks)
 8. Explain High level Control model of CPS. (S22 - Q4b, 04 marks / SUM25 - Q4a, 03 marks / S24 - Q5a, 03 marks)
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Unit 5: CPS Security

Repeated Questions:

1. **How Privacy maintained in CPS.**
(S24 - Q3c, 07 marks)
(SUM25 - Q3b, 04 marks)
(S22 - Q4c, 07 marks)
2. **How threats to CPS affect Medical domain.**
(SUM25 - Q3c, 07 marks)
(S22 - Q5c, 07 marks)
3. **Explain any one CPS Attack model.**
(S24 - Q5c, 07 marks)
(SUM25 - Q2c, 07 marks)
(S22 - Q5c, 07 marks)

Other Important Questions (Chronologically: S24 → SUM25 → S23 → S22):

4. How industrial domain is impacted by threats to CPS. (S24 - Q5b, 04 marks)
5. Write a note on authentication in CPS. (S23 - Q4a, 03 marks)
6. How threats to CPS affect Automotive domain. (S22 - Q1c, 07 marks)
7. How threats to CPS affect industrial automation. (S23 - Q2c OR, 07 marks)
8. Explain different Threats to CPS in detail. (SUM25 - Q5c, 07 marks)
