Total No. of Questions: 20

Enrollment No : _____

MEDICAPS UNIVERSITY

Faculty of Engineering

End Semester Examination May 2025

ME3EL24 Cyber Physical Production Systems

Programme	:	B.Tech.	**Branch/Specialisation**	:	ME
Duration	:	3 hours	**Maximum Marks**	:	60

Note: *All questions are compulsory. Internal choices, if any, are indicated. Assume suitable data if necessary. Notations and symbols have their usual meaning.*

Section 1 (Answer all question(s))

Marks CO BL

Q1. Which of the following is a key feature of Cyber-Physical Systems (CPS)? **1 1 1**

Rubric	Marks
Tight integration of computation and physical processes	1

- ○ High latency
- ◉ Tight integration of computation and physical processes
- ○ Isolated computing without interaction
- ○ No real-time constraints

Q2. What is one of the major challenges in designing CPS? **1 1 1**

Rubric	Marks
Ensuring real-time performance and reliability	1

- ○ Lack of physical components
- ◉ Ensuring real-time performance and reliability
- ○ Absence of sensors and actuators
- ○ No requirement for security measures

Q3. Which communication protocol is commonly used in automotive Cyber-Physical Systems? **1 2 1**

Rubric	Marks
CAN (Controller Area Network)	1

- ○ HTTP
- ◉ CAN (Controller Area Network)
- ○ FTP
- ○ Bluetooth Low Energy

Q4. What is the primary function of sensors in CPS? **1 2 1**

Rubric	Marks
Converting physical signals into digital signals	1

- ○ Processing data
- ◉ Converting physical signals into digital signals
- ○ Storing large amounts of data
- ○ Transmitting data to the cloud directly

Q5. In synchronous design, components operate based on- **1 3 1**

Rubric	Marks
Clock-driven execution	1

- ○ Continuous time intervals
- ◉ Clock-driven execution
- ○ Random event occurrences
- ○ No timing constraints

Q6. What is the purpose of a leader election algorithm in an asynchronous system? **1 3 1**

Rubric	Marks
To determine a single process to act as a coordinator	1

- ○ To remove faulty nodes
- ◉ To determine a single process to act as a coordinator
- ○ To enhance the security of the system
- ○ To disable real-time scheduling

Q7. What is a common cyber-attack in CPS? **1 4 1**

Rubric	Marks
Denial-of-Service (DoS) attack	1

- ○ Data encryption
- ◉ Denial-of-Service (DoS) attack
- ○ System optimization
- ○ Secure coding practices

Q8. Which of the following is a fundamental security requirement in CPS? **1 4 1**

Rubric	Marks
Confidentiality, Integrity, and Availability (CIA)	1

- ○ User-friendliness
- ◉ Confidentiality, Integrity, and Availability (CIA)
- ○ Open-source software usage
- ○ Disabling authentication protocols

Q9. In healthcare CPS, what is a common application of real-time monitoring? **1 5 1**

Rubric	Marks
Remote patient monitoring	1

- ○ Smart parking systems
- ○ Energy-efficient appliances
- ◉ Remote patient monitoring
- ○ Automated traffic signals

Q10. Which of the following is a key benefit of smart grid Cyber-Physical Systems? **1 5 1**

Rubric	Marks
Efficient energy management and demand-response	1

- ○ Increased manual control of electricity distribution
- ◉ Efficient energy management and demand-response
- ○ Reducing dependence on electricity
- ○ Disabling real-time energy monitoring

Section 2 (Answer all question(s))

Marks CO BL

Q11. What is a cyber-physical system? **2 1 1**

Rubric	Marks
Definition	2

Q12. (a) Explain the basic principles of design of a CPS. **8 1 2**

Rubric	Marks
Principles	8

(OR)

(b) What challenges you may face in designing a CPS?

Rubric	Marks
Challenges	8

Section 3 (Answer all question(s))

Marks CO BL

Q13. What is a CPS hardware platform? **2 2 1**

Rubric	Marks
Definition	2

Q14. (a) Why are sensors and actuators essential in CPS? **8 2 2**

Rubric	Marks
Reasons for sensors	4
Reasons for actuators	4

(OR)

(b) If a self-driving car needs to detect obstacles in real-time, which CPS components would be crucial, and why?

Rubric	Marks
components	3
reason	5

Section 4 (Answer all question(s))

Marks CO BL

Q15. Define Leader Election. **2 3 1**

Rubric	Marks
Definition	2

Q16. (a) What is the main difference between synchronous and asynchronous models in CPS? **8 3 2**

Rubric	Marks
Differences	8

(OR)

(b) How would you design a traffic signal system using a synchronous model?

Rubric	Marks
Process Steps	8

Section 5 (Answer all question(s))

Marks CO BL

Q17. Can a CPS be hacked? Comment. **2 4 2**

Rubric	Marks
Comment	2

Q18. (a) Why is confidentiality important in CPS security? **8 4 2**

Rubric	Marks
all reasons	8

(OR)

(b) If a hacker attempts a Denial-of-Service (DoS) attack on a smart grid, what security measures can be implemented to prevent it?

Rubric	Marks
All measures	8

Section 6 (Answer all question(s))

Marks CO BL

Q19. Define WSN. **2 5 1**

Rubric	Marks
Definition	2

Q20. (a) How does CPS contribute to healthcare monitoring systems? **8 5 2**

Rubric	Marks
Explanation	8

(OR)

(b) Suppose you are designing a smart city traffic management system. How can CPS principles help improve traffic flow and reduce congestion?

Rubric	Marks
Steps	8

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