International Institute of Information Technology – Hyderabad

EC3.202 Embedded Systems Workshop (H2)

End Semester Exam

Date: 19 Nov 2022
Max. Marks: 60
Start Time: 09:00 Hrs
Duration: **90 Minutes**

Instructions:

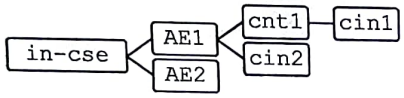
1. This is a closed-book exam.
2. MCQs may have more than a single correct answer (partial marking applicable).
3. There **is** negative marking of -1 mark for MCQs for **every** wrong answer.
4. There **is** negative marking of -0.5 mark for True / False questions.
5. Calculators are not allowed.
6. **Values in curly brackets {...} are for administrative purposes. Please ignore.**

Section I – MCQs

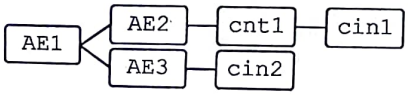
$[10 \times 2 = 20\ M]$

1. Which of the following is a correct hierarchy in a typical oneM2M resource tree? {CO-6}

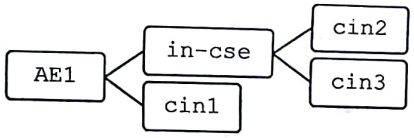
a)



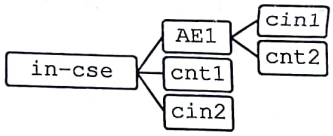
b)



c)



d)



2. Identify the MAC protocols in the given options where packet collisions do not happen. {CO-5}

a) CSMA/CD b) CDMA c) Polling d) Slotted Aloha

3. Which of the following oneM2M resources and their types are matched correctly? {CO-6}

a) `acp-ty1` b) `cnt-ty4` c) `cin-ty3` d) `sub-ty23`

4. Which of the following is a transducer? {CO-4}

a) Anemometer b) Battery c) Antenna d) None

5. Which of the following are fixed assignment protocols in the MAC layer? {CO-7}

a) FDMA b) TDMA c) CDMA d) SDMA

6. If a transducer outputs electrical energy, it must be further converted into voltage. {CO-3}

a) True, only if it feeds into a processor
b) Always true
c) True, only if it feeds into an analog circuit
d) Always false

7. Which of the following statements are false? {CO-5}

a) SPI supports single master and multiple slaves
b) I2C supports single master and multiple slaves
c) SPI supports multiple masters and multiple slaves
d) I2C supports multiple masters and multiple slaves

8. The advantages of using oneM2M as a service layer are: {CO-6}

a) It is a light-weight middleware standard
b) It prevents isolation of verticals
c) The AE layer allows complete interoperability
d) None of the above

9. *CSE in oneM2M stands for:* {CO-6}

a) Common Server Entity
b) Constrained Service Entity
c) Common Service Entity
d) Common Server Endpoint

10. Which of the following are not spread spectrum protocols? {CO-2}

a) CDMA b) FDMA c) SDMA d) LoRa

Section II – True / False

$[10 \times 1 = 10\ M]$

11. Digital parallel interfaces may operate asynchronously. {CO-3}

12. SPI supports multiple masters but only in half duplex mode. {CO-5}

13. In I2C, the bus drivers can pull a signal line low but cannot drive it high. {CO-2}

14. LEDs work on the principle of electron – hole recombination. {CO-1}

15. The probability of transmission success in Aloha is $Np(1-p)^{2(N-1)}$. {CO-5}

16. CSMA/CA improves on vanilla CSMA by resolving the hidden node problem. {CO-5}

17. GSM works by combining TDD with FDMA and TDMA to allow multiple users in a cell. {CO-7}

18. Zigbee uses IEEE 802.15.4 whereas Wi-SUN uses 802.11 for PHY and MAC layers. {CO-3}

19. Syntactic interoperability helps in understanding a device descriptor. {CO-2}

20. The header "X-M2M-Origin" is mandatory for any request sent to a oneM2M instance. {CO-6}

Section III – Descriptive Questions [30 M]

21. Briefly describe the following terminologies. [15 M]

a) UART [3 M] **{CO-5}**
b) LoRaWAN [3 M] **{CO-2}**
c) IEEE 802.11ah [3 M] **{CO-1}**
d) <AE> resource in oneM2M [3 M] **{CO-6}**
e) <sub> resource in oneM2M [3 M] **{CO-7}**

22. Write the title of your project and answer the questions below. [15 M]

a) ***Motivation***: Briefly explain the problem statement of your project and the motivation behind it. [3 M] **{CO-1}**
b) ***Selection of Components***: Justify your choice of MCU, sensors and actuators, communication protocols used in the final implementation. [3 M] **{CO-3}**
c) ***Data Flow and Visualization:*** Explain your rationale behind the implemented data flow elaborating the protocols used. Elaborate your dashboard implementation. [3 M] **{CO-4, CO-3}**
d) Complete block diagram of your project implementation with data flows. [6 M] **{CO-7, CO-6}**