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**

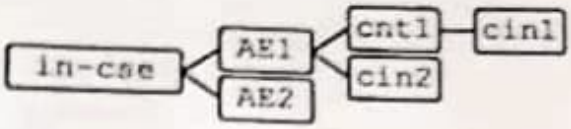
Instructions:

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.**

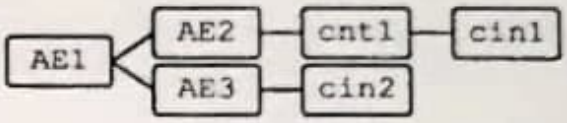
Section I – MCQs [$10 \times 2 = 20$ *M*]

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

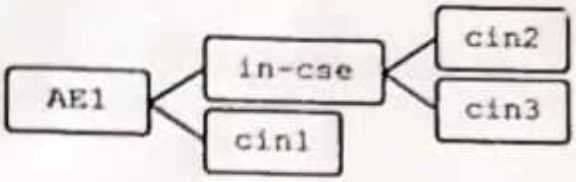
a)



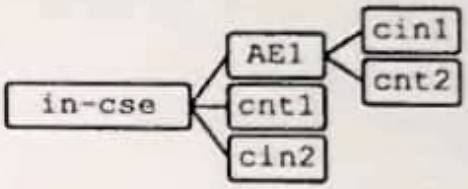
b)



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

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)