SMART SENSORS END SEMESTER EXAMINATIONS (DEC 2021/JAN 2022) - QN. PAPER - PART A

COURSE CODE : ICE 4058
COURSE NAME : SMART SENSORS
SEMESTER : VII
DATE OF EXAM : 27/12/2021
DURATION : 45 + 5 minutes

Instructions for Students:
(1) ANSWER ALL THE QUESTIONS.
(2) EACH QUESTION CARRIES 1 MARK.
(3) YOU ARE INSTRUCTED TO INFORM THE INVIGILATOR AFTER SUBMISSION OF THIS FORM IN THE CHAT SECTION.

* Required

* This form will record your name, please fill your name.

1. STUDENT NAME: *

2. REGISTRATION NUMBER: *

3. **Which of the following sensor is not used in biometric fingerprint sensing?** (1 Point)

- ◯ Pressure sensor
- ◯ Ultrasonic sensor
- ◯ Capacitive sensor
- ◯ Condenser sensor

4. **Which of the following statements are TRUE with respect to Biometric sensors?**

a) Lot of cost is needed in setting up the biometric network configuration.
b) Biometric databases are safe and cannot be hacked.
c) The authentication of biometric sensors is easy as well as quick.
d) Biometrics can be provided for living as well as dead people.
(1 Point)

- ◯ a) and b)
- ◯ a) and c)
- ◯ c) and d)

5. **In exponentially weighted moving average (EWMA) based fault detection chart, what is the ideal range of smoothing parameter λ?** (1 Point)

- ◯ $0.75 < \lambda < 1.25$
- ◯ $1 < \lambda < 2$
- ◯ $0 < \lambda < 0.3$
- ◯ $-0.5 < \lambda < 0$

6. **In biometric sensors, the iris code in iris recognition is made up of _____ digit number:** (1 Point)

- ◯ 1024
- ◯ 512
- ◯ 256
- ◯ 128

7. **Which of the following statement is not FALSE with respect to Iris Recognition?** (1 Point)

- ◯ It is not accurate for young children in age gap of 1-4 years
- ◯ Iris scanning involves direct contact with eye
- ◯ Iris scanning is not reliable for people of all age groups
- ◯ Iris recognition is less accurate in comparison to fingerprints.

8. **Assume that you are a chief engineer and investigating a sensor anomaly/fault that has occurred in a cement rotary klin plant. The anomaly appears for short bursts of time and then, the sensor signal returns to normal behavior. Which type of sensor anomaly could this be?** (1 Point)

- ◯ Aging anomaly
- ◯ Intermittent anomaly
- ◯ Damaged sensor anomaly
- ◯ Bias anomaly

9. **Which of the following statement is FALSE with respect to Internet of Things technology?** (1 Point)

- ◯ Internet of things is more Machine to Human relationship
- ◯ Somewhat true
- ◯ Internet of things require very low power
- ◯ Internet of things can self validate
- ◯ Internet of things sensors are small so that they can fit anywhere

10. **The wireless sensor technology topology that enables detection and isolation of faults is:** (1 Point)

- ◯ Star, Mesh and Tree
- ◯ Tree
- ◯ Mesh
- ◯ Star

11. **The following factor in wireless sensor network (WSN) focusses on density of nodes in single network:** (1 Point)

- ◯ Network topology
- ◯ Reliability
- ◯ Transmission media
- ◯ Scalability

12. **The _____ technique spreads the analog signal over large bandwidths at low power levels.** (1 Point)

- ◯ CDMA
- ◯ FDMA
- ◯ TDMA
- ◯ CPDD

13. **In which of the following devices, quartz is used to generate the mechanical deformation?** (1 Point)

- ◯ Digital mirror device
- ◯ Surface wave analog device
- ◯ Digital micro-mirror device
- ◯ Surface wave acoustic device

14. **Which of the following is not an emission for detection by smart remote emission detection system?** (1 Point)

- ◯ Nitrogen oxides
- ◯ Sodium dioxide
- ◯ Hyrdrocarbons
- ◯ Carbon Monoxide

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16. **Choose the events in order of their occurrence in remote keyless entry technology.**

a) The antenna receives signal and is then sent to the receiver for amplifying the received signal.
b) The transmitter generates a frequency when switch in the key is de-pressed.
c) If wrong code entered for 10 times, it will be treated as theft.
d) If code matches the stored code, motor drive circuit unlocks the door. (1 Point)

- ◯ b, a, c, d
- ◯ b, c, d, a
- ◯ b, c, a, d

17. **What is the maximum distance to which the sensed information can be transmitted in wireless zone smart sensing?** (1 Point)

- ◯ 500 feet
- ◯ 1000 feet
- ◯ 250 feet
- ◯ 1500 feet

18. **Which of the following is not an advantage of wireless zone smart sensing?** (1 Point)

- ◯ Less expensive to operate and maintain.
- ◯ It is more reliable and simpler to reconfigure
- ◯ Simple to install than traditional hard-wired applications
- ◯ Can be used in any of remote sensing locations

19. **A filtering technique that is best suited for capturing the outliers in piecewise constant signals:** (1 Point)

- ◯ FMH filter
- ◯ Median filter
- ◯ EWMA filter
- ◯ Mean filter

20. **Once large chunk of data is acquired from a large system using smart sensors, normalization is performed to bring all the data to same scale. What exactly is done in normalization process?** (1 Point)

- ◯ individual observation from a sensor variable is divided by the mean
- ◯ individual observation from a sensor variable is subtracted with variance and divided by the mean
- ◯ individual observation from a sensor variable is subtracted with mean and divided by the variance
- ◯ individual observation from a sensor variable is divided by the variance

21. **Choose the events is sequence that involves different steps for feature extraction in principal component analysis technique:**

a) Covariance matrix computation
b) Chose optimum principal components
c) Singular value decomposition
d) Normalization of data (1 Point)

- ◯ d, c, a, b
- ◯ a, d, b, c
- ◯ d, a, c, b
- ◯ a, c, d, b

22. **To which category does the following belong:**

A fault related to continuous disturbance entering from the environment. (1 Point)

- ◯ Gross parameter changes
- ◯ Structural changes
- ◯ Malfunctioning sensor
- ◯ Malfunctioning actuator

23. **The control limits for shewart chart are computed using the _____ approach:** (1 Point)

- ◯ Kernel density Estimation
- ◯ Z-distribution
- ◯ Student's t-distribution
- ◯ Three Sigma Rule

24. **Imagine you are driving a car which has cruise control system available in it. You have set speed of the car at 100 kmph and you sit back and relax as the cruise control takes over. Suppose you are having a continuous up/slope gradient for long hour and the main aim is to bring the actual speed close to the desired speed of 100 kmph no matter how long it takes. Which control action of the controller is needed here?** (1 Point)

- ◯ Proportional
- ◯ Proportional + Derivative
- ◯ Proportional + Integral
- ◯

25. **_____ is the component in process control network that monitors individual units placed in different remote locations.** (1 Point)

- ◯ Programmable Logic Controller
- ◯ Remote Terminal Unit
- ◯ Human Machine Interface
- ◯ Master Terminal Unit

26. **The communication technology that was used for communication within single production cell does not make use of _____ communication protocol** (1 Point)

- ◯ DeviceNet
- ◯ CANopen
- ◯ RS232
- ◯ Profibus

27. **The _____ scheme defines analytics applied to time-stamped data in OLE for process control.** (1 Point)

- Aggregation
- Alarms and Events
- Historical Data access
- Data access

28. **_____ level in distributed control systems deals with production control level.** (1 Point)

- Second
- Fourth
- Third
- First

29. **Which of the following statement/statements are not TRUE for Process Control Network?**

a) PCNs find it very hard for network intruders to access and control.
b) The corporate networks and PCN are protected with the help of strong access controls.
c) They are not secure since they are not connected to internet.
(1 Point)

- a) only
- c) only
- c) and d)

30. **Which of the following statements are TRUE with respect to IEEE 1451.4 standard?**

a) TEDS is contained within a node and the node located inside a transducer.
b) The communication with individual nodes connected to the MMI is controlled by URN
c) For Class 2 MMI, zero volts is a logic zero and –5 volts is a logic one. (1 Point)

- ◯ c) and d)
- ◯ b) and c)

31. **_____ models a smart transducer as a software PC with a plug & play as well as backplane.** (1 Point)

- ◯ IEEE 1451.3
- ◯ IEEE 1451.4
- ◯ IEEE 1451.2
- ◯ IEEE 1451.1

32. **_____ is the smart sensor linearization technique where large series of tangent lines are taken at different points in a linear or non-linear curve.** (1 Point)

- ◯ Piece-wise Linearization
- ◯ Ordinary least sqaures
- ◯ End-point fit
- ◯ Look up table

33. **In a closed loop control system, the smart sensor is usually located in _____ path.** (1 Point)

- ◯ Feed Forward
- ◯ Feed back
- ◯ None of the options
- ◯ Forward