Ref. No. : Ex/IEE/PE/B/T/422A/2022

Name of the Examination: **BIEE 4th YEAR 2nd SEM. EXAMINATION, 2022**

SUBJECT: **Electronic Olfaction & Taste Sensing**

Time: Four hours **Full Marks 70**

List of Course Outcomes (CO):

CO1: Explain and interpret artificial sensing system for smell and taste (K2, A1)

CO2: Understand the use of analytical instruments for smell and taste parameter measurements (K2, A2-study)

CO3: Study different analysis techniques for handling sensor responses (K4,A2)

CO4: Classify different types of sensors and instrument for smell and taste identification (K2, K4)

CO5: Apply electronic sensing systems for real time applications (K3, A3-adapt)

Instructions to the Examinees:

- Each module in the question paper matches up with the corresponding CO
- **Attempt questions for the attainment of all the COs**
- Alternative questions (if any) exist within a module, not across the modules
- Different parts of same question should be answered together

Attempt ALL Questions

Q1A. 5+7+3

a) With a clear diagram explain the basic anatomy of olfaction.
b) Electronic tongue has been evolved from the biological inspiration of human tongue—Explain.
c) Write the working principle of QCM sensor for volatile detection.

OR

Q1B. 6+4+5

a) Describe the operation of an electronic nose with detail schematic diagram.
b) How the metal oxide semiconductors work for sensing the volatiles?
c) Explain how the basic tastes can be classified using an electronic tongue.

Q2A. 6+4+5

a) How a mass spectrometer can analyze the composition of volatiles.
b) How humidity can affect the sensing performance of a gas sensor? How the effect of humidity can be handled during experimentation?
c) With circuit diagram explain the signal conditioning of sensor response obtained from electronic nose.

OR

Q2B. 6+5+4

a) Discuss any one olfactometric technique for human chemosensory perception.
b) Give the brief instrumentation of HPLC.
c) Name the different types of HPLC techniques. Explain any one type in brief.

Q3A. 4+6+5

a) For non-ideal solutions having volatile compounds, explain the physics of evaporation.
b) Besides Headspace method, explain any other method for odour handling and delivery system.
c) Explain any one electrochemical technique for taste sensing.

OR

Q3B. 4+6+5

a) What are the different sample flow systems available for odour handling and delivery system? What is the use of sampling bag for odour handling?

b) Explain Headspace measurement system using auto sampling stage.

c) How a preconcentrator can be used for sensitivity enhancement?

Q4A. 5+6+4

a) Explain the use of conducting polymers for volatile sensing.

b) Why preprocessing of sensor response is important before analysis? Explain any two preprocessing methods.

c) Give any one feature transform method with proper steps.

OR

Q4B. 4+6+5

a) What are supervised and unsupervised learning of pattern analysis?

b) Considering five sensor array of electronic tongue, explain a neural network based classification algorithm.

c) How the features can be extracted from the raw data using discrete wavelet transform?

Q5A. 6+4

a) What is the reason of fusing two different sensor responses? Show the steps of fusing responses from two sensor systems in data fusion model.

b) Explain the biological influence of aroma over the taste perception.

OR

Q5B. 5+5

a) Explain the feature fusion technique for combining the sensor response effect of electronic nose and electronic tongue.

b) Give an idea of fusing two sensory perceptions electronically in real system. Explain with schematic diagram.