Ref. No.: Ex/IEE/PE/B/T/422A/2024

Name of the Examination: **BIEE 4th YEAR 2nd SEM. EXAMINATION, 2024**

SUBJECT: **Electronic Olfaction & Taste Sensing**

Time: Four hours **Full Marks 100**

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

[Turn over

Attempt ALL Questions

Q1A.

6+7+7

a) Explain the term olfaction. Explain the differences between human and machine perception.

b) Explain with a diagram headspace sampling technique.

c) Explain the desirable properties of olfactory sensors?

OR

Q1B. **7+7+6**

a) Describe the operation of an electronic tongue with diagram.

b) Explain the working of MOS sensors. Mention two applications of MOS sensors.

c) What do you understand by an electrical double layer? Explain the function of working, reference, and auxiliary electrodes in the voltammetry technique with a proper diagram.

Q2A.

7+4+5+4

a) What are the different types of chemosensors? Explain any one with proper diagram.

b) What is potentiometry explain with a diagram.

c) What are the advantages and disadvantages of organic conducting polymer based chemosensors?

d) What are the applications of electronic nose system?

OR

Q2B. **7+6+7**

a) How does a QCM sensor work? Explain with a proper diagram.

b) Give a brief note on a) the sensor array and b) the sauerbrey equation.

c) With the circuit diagram explain the signal conditioning of sensor response obtained from electronic tongue.

Q3A. **6+7+7**

a) What do you understand by chromatography? Depict the difference between stationary and mobile phase in chromatography.

b) What do you understand by sensor fusion explain with a schematic diagram.

c) Explain any one electrochemical technique with a diagram.

OR

Q3B. **6+7+7**

a) Explain molecular imprinting technology with figure.

b) Classify olfactory sensors and discuss any one in detail.

c) What is a voltammogram? Discuss the difference between CV and DPV techniques.

Q4A. **6+7+7**

a) Discuss the functions of a) injector b) column c) detector in chromatography.

b) Explain reverse phase high performance liquid chromatography technique in detail.

c) Write down the advantages and limitations for HPLC method.

OR

Q4B. **6+7+7**

a) What are the different types of HPLC methods? Explain any one with a diagram.

b) Explain the functionality of each block of a gas chromatography system.

c) What are peak retention time and peak width? How to calculate the concentration of gas from the response curve.

Q5A. **10+10**

a) Explain how high blood protein can be estimated using a high performance liquid chromatography system with figure.

b) Explain how food quality estimation can be conducted using electronic nose and tongue fusion.

OR

Q5B. **(5+5)+(5+5)**

a) Explain the role of PCA in the discrimination of several constituents in the tea sample. Explain the separability index

b) Write short notes on PLSR and PCR for quantitative prediction estimation.