

Name of the Examination: **BIEE 4th YEAR 2nd SEM. EXAMINATION, 2023**

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.

7+7+6

- a) With a clear diagram explain the physiology of human taste sensing.
- b) Write the working principle of MOS sensor for volatile detection.
- c) Give a brief overview on odour classification based on chemical properties.

OR

Q1B.

7+7+6

- a) Describe the operation of an electronic nose with detail schematic diagram.
- b) How the conducting polymers work for sensing the volatiles?
- c) Explain any one electrochemical technique for taste sensing.

Q2A.

7+4+5+4

- a) What is the role of Gas Chromatogram to analyze the composition of a gas mixture?
- b) What is static and dynamic olfactometry?
- c) Explain the working principle of environmental chamber.
- d) What is the purpose of using Mass spectroscope alongwith Gas chromatogram(GC-MS).

OR

Q2B.

7+6+7

- a) Give the instrumentation of Mass spectrometer.
- b) Give a brief note on optical spectrometers.
- c) With circuit diagram explain the signal conditioning of sensor response obtained from electronic nose.

Q3A.

6+7+7

- a) What are the parametric and non-parametric pattern recognition techniques?
- b) Considering five sensor array of electronic nose, explain any statistical analysis algorithm for feature transform.
- c) Explain any one classifier model based on neural network with detail steps.

OR

Q3B.

6+7+7

- a) What are supervised and unsupervised learning of pattern analysis?
- b) Explain the classification method using Fuzzy based pattern analysis technique.
- c) How the features can be extracted from the raw data using PCA?

Q4A.

3+7+5+5

- a) What are the different sample flow systems available for odour handling and delivery system?
- b) Explain Diffusion method for odour delivery.
- c) Why preprocessing of sensor response is important before analysis? Explain any one preprocessing methods.
- d) Explain the principle of static measurement system for gas sensor response.

OR

Q4B.

6+4+6+4

- a) How the features can be extracted from the raw data using discrete wavelet transform?
- b) What is the use of sampling bag for odour handling?
- c) Explain the functionality of preconcentrator.
- d) How the transient sensor response can be analysed using optical tracer?

Q5A.

(4+6)+(5+5)

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

[Turn over

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- b) How an electronic nose and electronic tongue can be used separately for tea quality estimation?

OR

Q5B.

7+6+7

- a) Explain the fusion methodology at decision level for combining the sensor response effect of electronic nose and electronic tongue.
- b) Among three sensor fusion methods which one is advantageous and why?
- c) What are the advantages and drawbacks of electronic nose and tongue over human sensory system?