Ex/FTBE/PE/B/T/413B/2024

B.E (FTBE) FOURTH YEAR, SECOND SEMESTER EXAMINATION 2024

ELECTIVE-II: ANALYTICAL INSTRUMENTS IN FOOD ANALYSIS: PRINCIPLES AND PRACTICES

ANWER ANY TWO QUESTIONS

PART- I (50 MARKS)

Q1. You need to perform analyses of the given food products: **5 × 5 = 25**

1. Textural features of a loaf of freshly baked bread
2. 2-acetyl-1-pyrroline content in the freshly baked bread
3. Acrylamide content of the bread prior to packaging
4. Total Maillard reaction color products in the bread immediately after baking
5. Rancid odor of the bread sample on storage

a. Name the instruments and their essentials needed for each analysis with justification
b. Describe sample preparation needed for each analysis
c. Graphical/data outputs you would obtain post analyses in each case

Q2. Explain how rheological behavior of 'chocolate liquor' (feed for Melangeur) can be evaluated using Brookfield viscometer considering coaxial cylinder model with coaxial spindle and guard leg. Provide process flow sheet, data recording sheet, graph and flow behavior model equation necessary for evaluating the same. **25**

OR

Explain diagrammatically the working principle of GC-MS. Explain sample preparation and methodologies along with analysis outputs when 'mango aroma profile' is analyzed using the same.

Q3. Distinguish between (with explanations): **5 × 5 = 25**

a) Output from GC *vs.* GC-MS for Basmati rice aroma profile
b) Flow behavior model equation used by oil drilling industry for drilling mud *vs.* by RBD oil manufacturing industry
c) Procedure for estimation of a mixture of grape-anthocyanins by UV-Vis spectrophotometer *vs.* HPTLC
d) Rose aroma analysis by GC *vs.* Electronic nose
e) TA vs. TPA profile for sponge cake

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B.E.FOOD TECHNOLOGY AND BIOCHEMICAL ENGINEERING EXAMINATION 2024
(4^{th} Year, 1^{st} Semester)
Analytical Instruments in Food Analysis: Principles and Practices (FTBE/PE/B/T/413B)
Time: Three hours PART II (50 Marks) Full Marks:100

Answer Q.No. 1(compulsory) and any two from the following: **5×2=10**

Q.1. (i) Which region of FTIR analysis is termed as functional group region and finger print region?
(ii) Which wavelength of radiation (in μm) is absorbed for wavenumber 1760 cm^{-1}?
(iii) How many NMR responses can be expected for acetone and ethylene?
(iv) In a NMR spectra, which parameter is represented along x-axis?
(v) At which wavenumber, -OH group and C-H(sp^3) is detected in FTIR?

Q.2. (i) Briefly discuss the sample preparation procedure for IR spectroscopy. (ii) A mixture of three compounds were analyzed under FTIR and the peaks were found at 2500 cm^{-1}, broadly and intensed at 3310 cm^{-1}, 3000 cm^{-1},2980 cm^{-1} and at 1510 cm^{-1}, respectively. Justify the compounds with these observations. (iii) If a mixture of EtOH (Ethanol)(A) and acetone (B) is analyzed using FTIR, then discuss about the different bond stretches along with their respective wavenumber with the help of a schematic representation of FTIR graph. **5+9+6 =20**

Q.3. Wite short notes on **5×4 =20**

(a) Wave number (b) Difference between FTIR and NMR (c) $^1H_1$ NMR (d) Application of colorimetry

Q.4. (i) Discuss the basic objective of NMR spectroscopy. (ii) What is NMR response? How the NMR responses help to predict the molecular structure. Give two examples to justify your view. (iii) How many NMR responses can be observed for the following compounds (a) Methane (b) Toluene (c) 1-4 di-methyl benzene (d) Nitro-benzene (e) Acetic acid **3+7+10 =20**

Q.5 Write down the Beer's law and Lambert's law and how they are connected to predict the quantitative assurance of concentration of the sample? Discuss the different parts of a colorimeter along with a schematic diagram. Briefly discuss the procedure to estimate the concentration of given unknown solution. **7+7+6 =20**