Reg. No.

## Question Paper Code : X10829

### B.E./B.Tech. DEGREE EXAMINATIONS – NOV / DEC 2020

**Seventh Semester**

Electrical and Electronics Engineering

**OBT751 ANALYTICAL METHODS AND INSTRUMENTATION**

(Common to: Electronics and Instrumentation Engineering, Biomedical Engineering, Medical Electronics and Instrumentation and Control Engineering)

(Regulations 2017)

Time: 3 Hours                 Answer ALL Questions                 Max. Marks: 100

### PART- A (10 x 2 = 20 Marks)

1. List out the different components used in an optical spectrophotometer.
2. What is a monochromator?
3. Write the limitations of Beer-Lambert's law.
4. Why the glass cuvettes are not suitable for UV spectroscopy?
5. Define chemical shift and write its dimension
6. What is g-value in EPR?
7. Highlight the significance of the Van Deemter plot
8. Why does the magnitude of the Retardation factor (Rf) is always less than one?
9. How do you increase the accuracy of the potentiometer?
10. Compare and contrast AFM and STM

### PART- B (5 x 13 = 65 Marks)

11. a) Explain the components of an optical spectrophotometer with a schematic illustration. (13)

**OR**

b) What is the S/N ratio and discuss in detail the methods for S/N enhancement? (13)

12. a) Discuss the principle and instrumentation of a UV-visible spectrophotometer (13)

**OR**

b) Describe the principle of IR absorption spectrometry and illustrate a typical FTIR spectrum. (13)

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13. a) How does the NMR spectrometer works? Explain briefly the chemical shift in NMR spectroscopy. (13)

**OR**

b) Explain the principle and instrumentation of a mass spectrometer. (13)

14. a) Illustrate the working principle and applications of the HPLC with a neat sketch. (13)

**OR**

b) Describe the instrumentation of Gas Chromatography and write their applications. (13)

15. a) Discuss the principle and instrumentation for the potentiometric analysis. (13)

**OR**

b) How does an AFM work? Explain with the neat schematic illustration. (13)

### PART- C (1 x 15 = 15 Marks)

16. a) Substances A and B have retention times of 16.40 and 17.63 min, respectively, on a 30.0-cm column. An unretained species passes through the column in 1.30 min. The peak widths (at base) for A and B are 1.11 and 1.21 min, respectively. Calculate (a) the column resolution, (b) the average number of plates in the column, (c) the plate height, (d) the length of column required to achieve a resolution of 1.5, (e) the time required to elute substance B on the column that gives an Rs value of 1.5. (15)

**OR**

b) Deduce the significance of the Van Deemter H-u curve and explain how it can be correlated with the optimization of column performance. (15)

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