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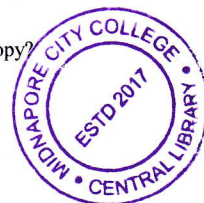
PG CBCS
M.Sc. Semester-IV Examination, 2022
CHEMISTRY
PAPER: CEM 401
(ADVANCED SPECTROSCOPY-II)

Full Marks: 40

Time: 2 Hours

GROUP - A**1. Answer any four questions from the following questions: 2×4 = 8**

- a) What principle is used in mass spectroscopy?
- b) What is nitrogen rule?
- c) What do you mean by McLafferty rearrangement? Give an example.
- d) Which type of nuclei show magnetic properties for purpose of NMR spectroscopy?
- e) Define the coupling constant.
- f) In case of OH and NH resonances in nmr, broad signals are observed. Explain.

**GROUP - B****2. Answer any four questions from the following questions: 4×4 = 16**

- a) (i) What is Doppler effect?
 (ii) Calculate Doppler shift in Mossbauer experiment, where $v_{\text{Source}} = 3.84 \times 10^{18}$ Hz and relative velocity of source and observer is 2.2 mms^{-1} . 2+2
- b) Explain different modes of fragmentation in the mass spectroscopy.
- c) How will you distinguish between the isomeric alcohols with molecular formula $\text{C}_4\text{H}_{10}\text{O}$ by mass spectroscopy?
- d) Acetylene protons are more shielded than ethylenic protons. Explain.
- e) Predict the number of signals for PMR and ^{13}C NMR and their multiplicities for PMR spectrum of p-Nitrotiluene.
- f) Why TMS is used as a reference standard in NMR spectroscopy? How many spin state possible for ^1H nucleus? 2+2

GROUP - C**3. Answer any two questions from the following questions: 8×2 = 16**

- a) (i) The MB-spectrum of $\text{K}_4[\text{Fe}(\text{CN})_6]$ consist of one line, where as that of $\text{K}_3[\text{Fe}(\text{CN})_6]$ consist of two line. Draw these spectra qualitatively and account for their appearance.
 (ii) Compare MB-spectrum of $\text{K}_4[\text{Fe}(\text{CN})_6]$ vs. $[\text{Fe}(\text{CN})_5\text{NH}_3]^{3-}$ and explain it. 4+4

(P.T.O.)



(2)

- b) How will you distinguish three isomeric butanols on the basis of mass spectroscopy?
- c) An organic compound has molecular formula C_4H_8O . In UV, it gave a characteristic band at $275 m\mu$ $\epsilon_{max} 17$. In infra-red, bands are formed at $2941-2857 (m)$, $1715(s)$ and $1460 cm^{-1} (m)$. In NMR, three signals appear at (i) 2.48δ quartet, (2H), 2.12δ singlet, (3H) and 1.07δ Triplet, (3H). Determine the structural formula of the compound.
- d) An organic compound with molecular mass 72 absorbs at $274 nm$ $\epsilon_{max} 17$. In infra-red, a strong absorption band is formed at $1715 cm^{-1}$ and medium absorption bands are formed at $2941-2857 cm^{-1} (m)$ and at $1460 cm^{-1} (m)$. The signals in the nuclear magnetic resonance spectrum are (i) 2.48δ quartet ($J = 7.3$ cps, 12 squares) 2.12δ singlet (17.6 squares) and 1.07δ (Triplet) ($J = 7.3$ cps, 18.2 squares). Determine the structural formula of the compound.
