Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

SEVENTH SEMESTER B. TECH. (INSTRUMENTATION AND CONTROL ENGG.)

END SEMESTER DEGREE EXAMINATIONS, NOVEMBER - 2018

SUBJECT: ANALYTICAL AND OPTICAL INSTRUMENTATION [ICE 4101]

TIME: 3 HOURS **MAX. MARKS: 50**

Instructions to candidates

- Answer **ALL** questions.
- Missing data may be suitably assumed.

1A	The different molecular vibration-modes of a given hydrocarbon sample needs to be investigated using an absorption spectroscopy technique. (i) Identify the type of spectroscopy suitable for this investigation. (ii) With relevant diagrams, explain any two sources of radiation and detectors each that are used during the experiment.	5
1B	Compare between the working principles of interference filters and monochromators that are used in optical spectrometers.	3
1C	List the various assumption made in order to obtain a linear absorbance-molar concentration relationship during spectrophotometric analysis?	1
1D	The molar absorptivity of Menbromin is 1.23×10^4 at 545 nm. Calculate the percentage transmittance observed by the detector of the spectrometer at 545 nm in a cell with a pathlength of 1.5cm, if the concentration of the given sample is found to be 37.8μM.	1
2A	The X-Ray absorption of lead is shown in Fig.2A. Explain the reasons for the sharp rise in the absorption coefficient at some regions of the curve.	2
2B	List out the various categories of Liquid Chromatography and explain any three with relevant schematic diagrams.	4
2C	Give a brief note on paper-electrophoresis and its various types of sample-separation modes.	3
2D	List the various factors affecting the width of spectral lines obtained during NMR spectroscopy.	1
3A	Compare and contrast the working and application of different Gas lasers.	5
3B	Discuss about the counters used as detectors in X-Ray spectrometers.	3
3C	A four level laser works better than a three level laser. Justify the statement.	2
4A	With a neat schematic diagram and required equations, explain the working of a Fabry-Perot interferometer.	5
4B	Compare the characteristics of transmission hologram and reflection hologram.	3
4C	Draw the block diagram of an optical communication system	2
5A	With schematic explain the working of CO_2 and SO_2 gas analysers.	5
5B	Describe the working and applications of a Laser Doppler Velocitimeter.	3
5C	Brief about the design of air quality monitor.	2

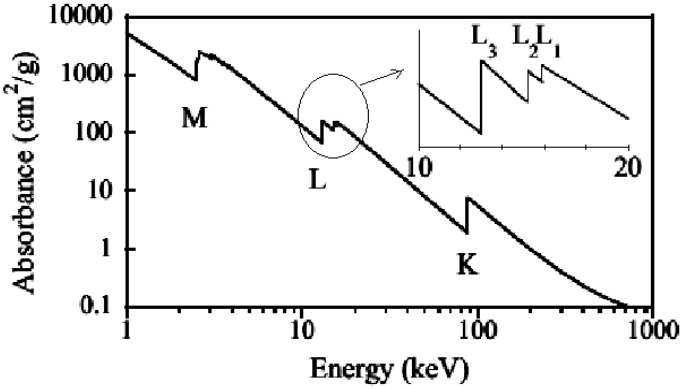
10000
1000
100
10
1
0.1
Absorbance (cm²/g)
M
L
K
L3 L2L1
10
20
1
10
100
1000
Energy (keV)

Fig. 2A

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