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MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
A Constituent Institution of Manipal University

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

END SEMESTER EXAMINATIONS, DEC- 2017

SUBJECT: Analytical and Optical Instrumentation [ICE-4101]

Time: 3 Hours

MAX. MARKS: 50

Instructions to Candidates:

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

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| 1A. | Prove that absorbance is the measure of concentration and also list its deviations. | 5 |
| 1B. | Classify different types of chromatography techniques. | 3 |
| 1C. | Draw the figure of Photo Multiplier Tube (PMT) and list its merits. | 2 |
| 2A. | Explain working of optical null method infrared Spectroscopy with neat diagram. | 5 |
| 2B. | Name the technique which can analyze the sample in solid form and explain the technique. | 3 |
| 2C. | If hydrogen is used as carrier gas in gas chromatography, name the suitable detector to be used and justify. | 2 |
| 3A. | With necessary equations, explain the need for radiofrequency in operation of NMR spectroscopy. | 4 |
| 3B. | Explain the formation of electronic image using X-rays. | 3 |
| 3C. | How mass spectrometer can be used as detector of liquid chromatography? Explain. | 3 |
| 4A. | Prove that Laser of two energy levels doesn't meet the requirement of light amplification. | 4 |
| 4B. | Explain Michelson interferometer with two applications. | 4 |
| 4C. | What is refractometer? Draw the figure for the same. | 2 |
| 5A. | With neat diagram, explain the working of time domain dispersion measurement. | 5 |
| 5B. | Differentiate step index and graded index multi-mode optical fibers. | 3 |
| 5C. | Draw the block diagram of optical fiber communication system. | 2 |