| Reg. No. | | | | | | | | | | |
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# MANIPAL INSTITUTE OF TECHNOLOGY

**(A constituent unit of MAHE, Manipal 576104)**

**1st SEMESTER M. Tech. (BME) DEGREE END SEM EXAMINATIONS, FEB/MAR 2021**
**SUBJECT: BIOMEDICAL INSTRUMENTATION (BME 5154)**
**(REVISED CREDIT SYSTEM)**
**Wednesday, 24th February 2021: 2 PM to 5 PM**

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

**Instructions to Candidates:**

1. **Answer all the questions.**
2. **Draw labeled diagrams wherever necessary.**

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| 1. | (a) | Explain bipolar limb lead systems used in ECG. | 03 |
| | (b) | Explain the principle (with three empirical thermocouple laws) of thermocouples for temperature measurements | 02 |
| | (c) | Illustrate and interpret in detail the equivalent circuit for an electrode- skin interface. | 05 |
| 2. | (a) | State the working principle of Nd-YAG laser. | 03 |
| | (b) | Discuss in detail the use of cardioverters with block diagram. | 05 |
| | (c) | What is stimulated emission of light? | 02 |
| 3. | (a) | Describe the principle of bubble and membrane oxygenator and their comparison in detail. | 03 |
| | (b) | Explain the principle of extracorporeal shock-wave lithotripsy and describe different methods used for generating the shock waves in extracorporeal shock-wave lithotripsy. | 05 |
| | (c) | Describe in detail about the gases used in anesthesia. | 02 |
| 4. | (a) | Explain with block diagram, the working principle of pyroelectric vidicon camera for thermal imaging. | 03 |
| | (b) | Describe in detail the different generations of CT scanner machines. | 05 |
| | (c) | Describe M scan, and B scan modes of ultrasonography in detail | 02 |
| 5. | (a) | Explain the principle of MRI imaging. Differentiate between T1 and T2 relaxation. | 05 |
| | (b) | Illustrate and explain the principle of anger camera (gamma camera). | 03 |
| | (c) | Explain interaction of gamma ray with matter and how this is used for the detection of gamma rays in SPECT systems. | 02 |