Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

(A constituent unit of MAHE, Manipal 576104)

IV SEMESTER B.Tech.(BME) DEGREE MAKE-UP EXAMINATIONS JUNE 2019

SUBJECT: **ELEMENTS OF BIO-INSTRUMENTATION (BME 2201)**

(REVISED CREDIT SYSTEM)

Wednesday, 19th June 2019: 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.**

1.	(a)	Discuss the parameters to be considered for selecting a transducer for a particular measurement.	3
	(b)	A resistance wire strain gauge with a gauge factor of 2 is bonded to a steel structural member subjected to a stress of 100 MN/m^2. The modulus of elasticity of steel is $200GN/m^2$. Calculate the percentage value of the gauge resistance due to applied stress.	3
	(c)	Write a note on non-metallic resistors used for temperature measurement. List the advantages and disadvantages of the transducer mentioned above, with two medical applications of the same.	4
2.	(a)	At frequencies above 20KHz, the impedance of a bio-potential surface electrode in contact with the electrolyte is 500Ω. At frequencies less than 50Hz, the electrode-impedance is 30KΩ. The corner frequency is 100Hz. From the preceding data, determine the circuit model for the electrode.	4
	(b)	Discuss the construction of an LVDT and explain how it can be used to measure displacement.	3
	(c)	What is half-cell potential? With suitable examples, explain how the half-cell potential is developed in the metal.	3
3.	(a)	With a neat figure, explain the working of a balancing-null type of recorder.	4
	(b)	Explain in detail, the standard 10-20 system of electrode placement used during EEG recording.	3
	(c)	Explain the method used for measuring volume changes in a limb.	3

4. (a) Differentiate the following: 3
a) VVI from VVIR pacemakers.
b) Needle electrode from a surface electrode.

(b) What are the key considerations in the design of a defibrillator's electrode? Also, draw and explain the internal and external type of defibrillator electrodes in detail. 4

(c) List the precautions to be taken to minimize the electric-shock hazard. 3

5. (a) (i) Differentiate 'Unipolar electrodes' from 'Bipolar electrodes' used in pacemakers. 2+3

(ii) Explain the asynchronous pacemaker in detail.

(b) Draw the energy-level diagram and explain the laser set-up of a molecular gas laser. Give two medical applications of this laser. 5