Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

Manipal University, Manipal – 576 104

4th SEMESTER B.Tech.(BME) DEGREE MAKE UP EXAMINATIONS JUNE/JULY 2016

SUBJECT: ELEMENTS OF BIO-INSTRUMENTATION (BME 2201)

(REVISED CREDIT SYSTEM)

Tuesday, 28th June 2016: 2.00 pm- 5.00 p.m

TIME: 3 HOURS **MAX. MARKS: 100**

Instructions to Candidates:

1. **Answer ALL FIVE full questions.**
2. **Draw labeled diagram wherever necessary**

1. (a) (i) Explain the photoconductive transducer in detail and describe how it can be used to detect pulse of a subject. (4+4)

(ii) Determine the total change in length for a strain indicator wire in a strain gauge when GF=3, original wire resistance =0.5Ω, final strained wire resistance=0.7Ω, pre-strained wire length=50mm. (3)

(b) (i) Explain a type of non-metallic thermal resistor in detail. (6)

(ii) An RTD has $\alpha=0.004^0$C and R=300Ω at 30^0C. Determine the resistance at 0^0C and 60^0C. (3)

2. (a) (i) List the problems of using the standard hydrogen electrode. (2)

(ii) Explain the equivalent circuit model of a bio-potential electrode in contact with its electrolyte. (6)

(b) Calculate the series resistance and frequency response of a KCL filled microelectrode if the pipette radious is 0.2μm and the inside tip radious is 0.15μm.The value of ρ for KCl is 3.7Ωcm and the taper angle is π/180. Dielectric constant of glass is 4. The electrode is immersed 3cms deep in the electrolyte. (5)

(c) Define an electrode. With suitable examples, explain how the half-cell potential is developed and also list the factors that affect the electrode potential. (1+4+2)

3. (a) (i) Draw and explain the unipolar chest lead configuration in detail. (4)

(ii) With a neat block diagram, explain the EEG recording system. (6)

(b) Write a note on the cardiac heart sounds. (5)

(c) Explain the Ruby laser in detail along with its medical applications. (5)

4. (a) Explain in detail, a type of recorder that is not based on the PMMC principle. (10)

(b) Explain the atrial synchronous pacemaker in detail. (10)

5. (a) Describe the physiological effects of electric current on the human body. Specify the current range at which the different effects occur. (5)

(b) Explain the principle behind the 'grounding' technique used to prevent electrical accidents. Illustrate with an example, the importance of grounding. (2+5)

(c) Which type of defibrillator would be most suitable when effective defibrillation is required at a much lower voltage level? Explain the same in detail. (8)