Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

(A constituent unit of MAHE, Manipal 576104)

VII SEMESTER B.Tech.(BME) DEGREE END SEMESTER EXAMINATIONS NOVEMBER 2019
SUBJECT: MEDICAL EQUIPMENTS (BME 4103)
(REVISED CREDIT SYSTEM)
Saturday, 23rd November 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 a type of audiometer that can be used to assess auditory pathology in neonates. Also, indicate the signal intensity range generated by pure tone audiometers. 3+1

   (b) (i) A subject having hearing loss of 70 dB is fitted with a hearing aid. The net efficiency of the air to bone transmission system is 10 dB loss. What is the gain provided by the hearing aid? 1+2

   (ii) Differentiate the different types of gas regulators.

   (c) Identify and explain the therapy unit which can be used to exercise the respiratory muscles and mention the other indications for using this unit. 3

2. (a) (i) Differentiate cutting mode from coagulation mode in Electrosurgical unit (ESU). 2+2

   (ii) Describe the risk of fire hazard while using ESU and indicate the precautions to minimize this hazard.

   (b) (i) State the different metabolites that contribute to the total skin absorbance with transcutaneous bilirubin meter. 1+1

   (ii) Give reasons: Alternating current is used as an excitation signal in transthoracic apnea monitors.

   (c) (i) Calculate the power dissipated in 0.2 m^3 of tissue having a resistivity of 1.6 x 10^3 Ωm (Given the current density to be 0.36 A/m^2). 2+2

   (ii) Give an example each for liquid and gaseous anesthetic agent, and mention the advantage of using inhaled anesthetic agents as compared to injected anesthetic agents.

3. (a) (i) Differentiate forward-view from lateral-view endoscopes and discuss the important features of fiber-optic endoscopes. 1+2

(ii) Compare percutaneous ultrasonic lithotripsy from water-bath lithotripsy. 2

(b) With a neat figure, explain the parts and working of a thermography equipment. Also, compare the different detectors used in thermographs. 3+2

4. (a) (i) Find the attenuation of a 4 MHz ultrasound beam after a two-way trip through a 5 cm thick section of liver. [Assume the attenuation coefficient to be -1dB/ cm/ MHz]. 1+3

(ii) Explain the steps involved in signal processing and scan conversion process in an ultrasound equipment.

(b) (i) In a blood cell coulter counter, the threshold is set to zero and the output display reads 5.31 $x10^{12}$/ liter. The threshold is then set to T1 and the output reading becomes 5.18x 10^{12}/ liter. The threshold is then set to T2 and the display shows 0.18 x 10^{12}/ liter. Find the count of RBC, WBC and platelets in units of cells/ liter. [Assume: $0 < T1 < T2$] 3

(ii) Indicate the drawbacks of conventional methods of blood cell counting, and explain an automatic method which uses laser light to count blood cells. 1+2

5. (a) Explain the features of an ideal Heart-Lung machine. Differentiate natural and artificial lungs in terms of their blood transit time and exchange surface area. 3+2

(b) Discuss the advantages and disadvantages of peritoneal dialysis and explain with a neat figure, the most effective design of the hemodialyser. 2+3