Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

VI SEMESTER B.Tech (BME) DEGREE END-SEM EXAMINATIONS APRIL/MAY 2017

SUBJECT: MEDICAL EQUIPMENTS (BME 3202)

(REVISED CREDIT SYSTEM)

Tuesday, 25th April 2017: 2 PM to 5 PM

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

Instructions to Candidates:

Answer ALL questions

1.	(a)	(i) Explain in detail, a non-invasive method of determining the percentage of oxygen saturation in the arterial blood.	(5)
		(ii) Define the following terms used in the description of lung volume: TV, IRV, ERV, RV & VC.	(5)
	(b)	(i) A spirometer has a radius of 15 cm and a maximum height of 10 cm. Determine the maximum gas volume of the spirometer. Also, determine the output voltage of the potentiometer at the maximum height of the bell jar. The battery voltage is 12V.	(3)
		(ii) What is the purpose of an oxygen therapy unit? Explain the parts of the oxygen therapy unit in detail.	(4)
		(iii) Differentiate 'Fleish type' from 'Lilly type' of pneumotachometer. Mention the drawbacks of these pneumotachometers.	(3)
2.	(a)	(i) List and explain the performance parameters that can be used to assess the efficiency of hearing aids.	(6)
		(ii) What are the advantages and disadvantages of 'body level' hearing aids?	(2)
		(iii) Calculate the sound pressure level (in dB) of a subject, given the measured sound pressure is 0.06Pa and the threshold of normal hearing is 20µPa.	(2)
	(b)	(i) Which type of lithotripsy would be ideal for non-invasive removal of renal stones of small size? Explain the same with a neat figure.	(4)
		(ii) Differentiate 'desiccation' from 'fulguration'. What is the frequency range of the current used in electrosurgery? Also, mention the precautions to be taken while using an ESU.	(2+1+3)

3. (a) (i) What are the different signs used to identify the depth of anesthesia. With a neat figure, explain the closed circuit anesthesia machine in detail. (2+4)

(ii) What are the different ways in which heat loss can take place from the body of neonates? What are the measures that can be taken to minimize heat loss from the infant's body? (4)

(b) (i) What is hyperbilirubinemia? What are the problems caused by hyperbilirubinemia? Explain how the levels of bilirubin can be monitored in neonates non-invasively. (1+1+4)

(ii) What is the upper limit for the diameter of the shaft used in an endoscope? Also, Write a note on 'wireless endoscopy'. (1+3)

4. (a) (i) With a neat block diagram, explain echocardiograph in detail. (4)

(ii) What happens to the power of the ultrasound beam, if the intensity of a sound beam remains unchanged, while the beam area is reduced to half? (2)

(iii) The maximum sound intensity that the ear can tolerate at 1KHz is approximately $1W/m^2$. What is the maximum displacement in air corresponding to this intensity (Z=430 for air). (2)

(b) (i) What are the problems encountered due to direct contact of blood and gas in an oxygenator. Which type of oxygenator can be used to avoid these problems, explain the same in detail. (2+4)

(ii) Give a comparison of the different oxygenators used in the heart- lung machine. (6)

5. (a) (i)Why Thermography is considered a good imaging modality for early diagnosis of cancer? With a neat figure, explain the thermography equipment in detail. (2+5)

(ii) Define 'Hematocrit'. Explain the method of counting blood cells by the principle of electrical conductivity. (1+5)

(b) With a neat figure, explain the hemodialysis machine in detail. (7)