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Answer any FIVE full questions.

## MANIPAL INSTITUTE OF TECHNOLOGY

A Constituent Institute of Manipal University) Manipal – 576 104



## 1st SEMESTER M.TECH (BME) DEGREE MAKE UP EXAMINATIONS, DEC/JAN 2015-16

## **SUBJECT: BIO-INSTRUMENTATION (BME 503)**

(REVISED CREDIT SYSTEM)

Tuesday, 5<sup>th</sup> January 2016: 2.00 p.m.- 5.00 p.m

TIME: 3 HOURS MAX. MARKS: 100

Instruction to Candidates:

## 1. (i) Explain in detail one type of passive transducer that uses active circuit (6) element. (ii) What is the significance of 'gauge factor' in a strain gauge transducer? (2) Mention the gauge factor of metals. (i) Define electrode potential. Explain with an example, how the 'Helmholtz (1+4)electrical double' layer is developed at the interface of the metal and the electrolyte. (ii) Draw and explain the equivalent circuit model of a bio potential surface (7) electrode in contact with its electrolyte. 2. With neat figures, explain in detail the bipolar limb lead and unipolar chest (5+5)a) lead configuration used in the ECG measurement. (i) Show that the induced voltage is proportional to the flow rate of blood in b) (5+3)an electromagnetic blood flow meter. With a neat figure, also explain the design of the flow head. (ii) A Doppler blood-flow velocity probe is set at an inclination of 45<sup>0</sup> with (2) the skin surface to measure the blood flow of an underneath blood vessel. The frequency of the ultrasonic wave transmitted to the blood flowing in the vessel is 7MHz. The Doppler shift in the frequency of the received ultrasonic wave is observed to be 10kHz. Calculate the blood velocity. Assume the velocity of the sound in the flowing blood=1500 m/s.

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3.	(a)	(1) A pacemaker is given a code "VAT". Identify the type of the pacemaker and explain the same in detail.	(8)
		(ii) What is the output voltage provided by the Lithium Iodide battery source?	(1)
	(b)	(i) Draw and explain the two basic types of cardiac defibrillator electrodes.	(5)
		(ii) With a neat block diagram, explain the DC defibrillator which is synchronized with the ECG signal.	(6)
4.	(a)	Explain the following i) Thermography ii) Otoscope iii) CPAP iv) Dark packing fraction v) Desiccation	(5)
	(b)	(i) Explain the different processes that can cause heat loss from the neonates' body.	(4)
		(ii) Differentiate positive pressure ventilator from a negative pressure ventilator.	(4)
	(c)	Explain the non-invasive type of lithotripsy in detail.	(7)
5.	(a)	(i) Explain the hollow-fiber type of hemodialyser in detail.	(4)
		(ii) Mention the proportion of water and concentrate used in the dialysate (in fixed ratio type)	(1)
	(b)	(i) With a neat block diagram, explain the bionic ear.	(7)
		(ii) Explain the evoked response audiometers in detail.	(8)
6.	(a)	List the electroacoustic properties of the hearing aids and explain the same in detail.	(7)
	(b)	(i) Explain with a block diagram, the echocardiograph.	(7)
		(ii) List and explain the medical applications of thermography.	(6)

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