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TIME: 3 HOURS

MANIPAL INSTITUTE OF TECHNOLOGY

Manipal University, Manipal – 576 104



THIRD SEMESTER B.TECH. DEGREE END-SEMESTER EXAMINATIONS DEC 2015

SUBJECT: BIOMEDICAL INSTRUMENTATION (BME 205) (REVISED CREDIT SYSTEM)

Thursday, Dec 03, 2015: 9.00 am- 12.00 noon

MAX. MARKS: 100

 Instructions to Candidates: 1. Answer any FIVE full questions. 2. Draw labeled diagram wherever necessary 					
1.	(a)	Mention the primary signal characteristics and the transducer used in the following measurements, (i) Respiratory flow rate, (ii) Impedance Pneumogram and (iii) Tocogram.	(3)		
	(b)	(i) Define gauge factor. What does it signify? Specify the gauge factor of metal and semiconductor material.	(4)		
		(ii) Explain the construction and working of semiconductor temperature transducer in detail.	(6)		
	(c)	(i) Determine the total change in the length of a strain indicator wire in a strain gauge, when the gauge factor = 3, original wire resistance = 0.5Ω , final strained wire resistance= 0.7Ω and the pre-strained wire length is 50mm.	(2)		
		(ii) What is the principle behind photomultiplier tube? Explain with a neat diagram.	(5)		
2.	(a)	(i) Explain how an electrical double layer is formed at the electrode- electrolyte interface.	(5)		
		(ii) Explain two methods for manufacturing the Ag/AgCl electrode.	(5)		
	(b)	(i) With neat figures, explain the types of needle electrodes in detail.	(6)		
		(ii) Explain any two applications of an inverting amplifier.	(4)		
3.	(a)	Why is the augmented unipolar limb lead configuration preferred over unipolar limb lead configuration in ECG recordings? Draw and explain the unipolar chest lead configuration in detail.	(2+3)		
	(b)	(i) What are the characteristic waves that can be observed in an EEG recording? Explain the features of each of these waves.	(4)		
		(ii) List the different types of microphones that can be used to detect the heart sounds. Explain the principle of working of each of them.	(1+3)		
	(c)	What is Doppler effect? Explain how this principle can be used to measure the blood flow.	(2+5)		
4.	(a)	(i) Explain the atrial synchronous pacemaker in detail.	(8)		
		(ii) What is the voltage provided by Lithium batteries?	(1)		
		(iii) What are the basic requirements of an implantable pacemaker?	(3)		

	(b)	Mention the drawbacks of AC defibrillation and explain the capacitive discharge DC defibrillator in detail.	(2+6)
5.	(a)	(i) Explain the He-Ne laser in detail. Also, give the energy level diagram of its transitions.	(5+5)
	(b)	List the different types of recorders that work on the PMMC (Permanent Magnet Moving Coil) principle. Explain one type of recorder that is not based on the PMMC principle.	(2+8)
6.	(a)	Differentiate micro shock and macro shock.	(2)
	(b)	Explain the principle behind the 'grounding' technique used to prevent electrical accidents. Illustrate with an example, the importance of grounding.	(5+5)
	(c)	What are the precautions to minimize the electric shock hazard?	(8)
