Question Paper

Exam Date & Time: 09-May-2024 (02:30 PM - 05:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

IV Semester BTech (BME) End Semester Examination April/ May 2024

BIOMEDICAL INSTRUMENTATION [BME 2222]

Marks: 50 **Duration: 180 mins.**

Descriptive Questions

Answer all the questions. Section Duration: 180 mins

Answer ALL questions
Draw diagrams wherever necessary

1)		Distinguish between active and passive transducer and explain one type of active phototransducer in detail.	(4)
	A)		
	B)	An LVDT has a secondary voltage of 5V for a displacement of ±12.5 mm. Determine the output voltage for a core displacement of 8mm from its central position.	(3)
	C)	Differentiate between RTD, thermocouple and thermistors.	(3)
2)		Determine the type of transducer that can be used to pick up ECG signals and explain the working of this transducer in detail.	(4)
	A)		
	B)	With a neat figure, illustrate how unbonded strain gauge can be used to measure blood pressure invasively.	(3)
	C)	Comment on the impedance of a surface electrode as a function of frequency and find the series impedance of a pottasium chloride microelectrode using the mentioned values. Given $\rho = 3.7\Omega cm$, $r = 0.1\mu m$, $\alpha=\pi/180$.	(3)
3)		Interpret the input circuit of the ECG machine in providing protection against overvoltage, increasing the input impedance and reducing interference.	(4)
	A)		
	B)	Differentiate between coaxial, multielement and fine wire needle electrodes.	(3)
	C)	Illustrate with a neat diagram, how volume changes can be measured in the extremities of the body?	(3)
4)		In an electromagnetic blood flow meter, prove that the induced voltage is proportional to the flow rate. Also, illustrate with a neat figure, the principle of electromagnetic induction.	(3)
	A)		
	B)	A voltage pulse of 1500V peak amplitude and 5 msec duration is delivered to two defibrillator paddles attached to a patient. The thorax resistance $R_T = 50\ \Omega$. Determine the electrode- skin resistance at each electrode such that 100J of energy is delivered to the patient. Assume $R_D = 5\ \Omega$.	(3)

	C)	Draw the energy level diagram and explain the laser set up of a solid-state pulsed laser.	(4)
5)		Interpret the five-letter code used in the coding system to identify the function of the pacemaker and explain in detail the pacemaker identified by the code 'VAT'.	(5)
	A)		
	B)	Comment on the shortcomings of the 'grounding' method and explain any two methods of electrical accident prevention which does not require grounding of the equipment.	(3)
	C)	Compute the energy stored by the lithium-iodide battery if the battery rating is 1Ah with a terminal voltage of 1.5V.	(2)

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