Exam Date & Time: 20-Jun-2022 (02:00 PM - 05:00 PM)



MANIPAL ACADEMY OF HIGHER EDUCATION

FOURTH SEMESTER B.TECH END SEMESTER EXAMINATIONS, JUNE 2022 BIOMEDICAL INSTRUMENTATION [BME 4301]

Marks: 50

Duration: 180 mins.

A

Answer all the questions.

Ins	tructions to	o Candidates: Answer ALL questions. Missing data may be suitably assumed.	
1)		Illustrate with an example, the significance of 'grounding' and 'ground fault circuit interrupter' in a hospital environment.	(4)
	A)		
	B)	Illustrate the augmented- unipolar limb lead configuration, in an ECG recording system.	(3)
	C)	Discuss the origin of the normal heart sounds, the causes of abnormal heart sounds, and, how the abnormal heart sounds are differentiated from the normal heart sounds.	(3)
2)		With a neat circuit diagram, determine the expression for the output of an instrumentation amplifier, when the input to the amplifier is the output of the Wheatstone's bridge with a resistive transducer in one arm.	(4)
	A)		
	B)	Illustrate the features of modern computed tomography equipment.	(3)
	C)	Illustrate the measurement of blood velocity using the Doppler shift method.	(3)
3)	۵)	An RTD is used for R ₄ in a bridge circuit shown in the figure below. The RTD has $R(22^{\circ}C) = 400\Omega$ and $\alpha=0.004/^{\circ}C$. The bridge has $R_1=4K\Omega$, $R_2=1K\Omega$, and R_3 is a 10K Ω pot. The source voltage Vs is 10V DC.	
	11)	(i) If the bridge is balanced at $R_3=1.5K\Omega$, calculate the RTD temperature.	
		(ii) Also, calculate the RTD temperature when the output voltage V_0 is 10mV with the bridge unbalanced.	(4)

B)

A)



(i) Differentiate defibrillation and cardioversion.

		(ii) Differentiate 'Fixed rate' and 'Demand type' pacemakers.	(3)
	C)	Differentiate 'Micro-shock' and 'Macro-shock'.	(3)
4)	A)	A blood pressure transducer is constructed of 4 strain gauges connected to the Wheatstone bridge. The sensitivity of the pressure transducer is nominally rated 60μ V/V /mmHg. Determine the output voltage if the bridge excitation is 10V dc when a blood pressure of 120mmHg is being measured. If the GF of the strain gauges used is 2.2, calculate the strain on the gauges.	(4)
	B)	A strain gauge of length 0.1m is bonded to a surface of area 4cm^2 having a modulus of elasticity E=200GN/m ² . The strain gauge unstrained resistance is 200 Ω and gauge factor=10. When the load is applied, the resistance changes by 0.01 Ω . Determine the stress and the load applied.	(3)
	C)	Demonstrate graphically, the measurement of systolic/diastolic arterial pressures using	

- C) Korotkoff sounds. (3)
- 5) Illustrate the 10-20 system of electrode placement used for the measurement of the electroencephalogram.
 - B) Discuss how the X-rays help to visualize the internal structures of the body and, the advantages of digital X-ray systems over conventional X-ray systems. (3)
 - C) With a suitable schematic, discuss the structure and significance of 'floating' surface (3) electrodes.

(4)

-----End-----