

END SEMESTER EXAMINATIONS (DECEMBER 2021/JANUARY 2022) - QUESTION PAPER - PART A

COURSE CODE : ICE 4064
COURSE NAME : Biomedical Instrumentation and Equipment's
SEMESTER : VII
DATE OF EXAM : 20/12/2021
DURATION : 45 + 5 minutes

Instructions for Students:

(1) ANSWER ALL THE QUESTIONS.

(2) EACH QUESTION CARRIES 1 MARK.

(3) YOU ARE INSTRUCTED TO INFORM THE INVIGILATOR AFTER SUBMISSION OF THIS FORM IN THE CHAT SECTION.

* Required

* This form will record your name, please fill your name.

1

STUDENT NAME: *

2

REGISTRATION NUMBER: *

The value must be a number

3

The following are properties of ultrasound waves as applied in medical imaging, except?
(1 Point)

- ☐ They depend upon the medium through which it propagates
- ☐ They are electromagnetic
- ☐ They are acoustic
- ☐ They are longitudinal
- ☐ All these are correct

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Pressure transducer for measuring blood pressure is from
(1 Point)

- ☐ Strain gauge transducer
- ☐ Strain gauge or Capacitive transducer
- ☐ Fiber optic transducer
- ☐ Resistive transducer

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In case of ECG, which leads primarily, measure forces moving from head to the feet (inferiorly)?
(1 Point)

- ☐ VI
- ☐ aVF
- ☐ Lead I
- ☐ aVL
- ☐ None of these

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The lung volume expired during maximal forced expiration following a maximal inspiration is known as:

(1 Point)

- ☐ Total ventilatory capacity
- ☐ None of the above
- ☐ Total functional residual capacity
- ☐ Total lung capacity
- ☐ Vital capacity

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Match the following and select the correct answer from the codes given below.
(1 Point)

Group 1	Group 2
A. QRS complex	1. Depolarization of ventricles
B. P wave	2. Repolarization of the ventricles
C. PR interval	3. Travel time between SA node and AV node
D. QT interval	4. Depolarization of the atria
E. T wave	5. Cycle of ventricular depolarization/repolarization
F. ST segment	6. The resting period after ventricular depolarization

- ☐ A-2, B-4, C-6, D-1, E-3, F-5
- ☐ A-6, B-5, C-4, D-3, E-2, F-1
- ☐ A-1, B-4, C-3, D-5, E-6, F-2
- ☐ A-1, B-4, C-3, D-5, E-2, F-6
- ☐ A-3, B-4, C-1, D-5, E-2, F-6

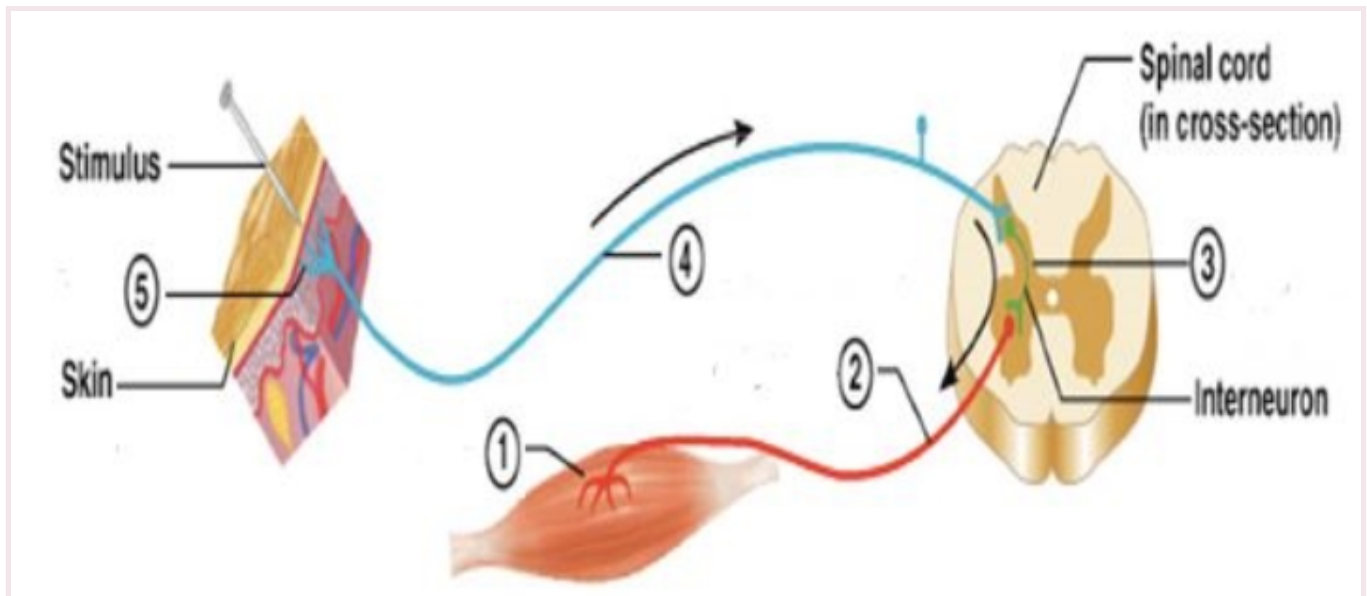
8

Choose the wrong statement of the following
(1 Point)

- ☐ Resistance of photo resistors increase with decrease in light intensity
- ☐ Resistivity of the metal decreases with increase in temperature
- ☐ Resistance of the metals increases with rise in temperature
- ☐ Resistance of thermistors fall with increase in temperature

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Name the body part correctly and choose from the option
(1 Point)



- ☐ 5-Receptor, 2-Sensory neuron, 3-Integration center, 4-Motor Neuron, 1-Effector
- ☐ 5-Receptor, 1-Sensory neuron, 3-Integration center, 2-Motor Neuron, 4-Effector
- ☐ None of these
- ☐ 1-Receptor, 2-Sensory neuron, 3-Integration center, 4-Motor Neuron, 5-Effector
- ☐ 1-Receptor, 4-Sensory neuron, 3-Integration center, 2-Motor Neuron, 5-Effector

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Large electric discharge in defibrillation is possible using ____ electrodes
(1 Point)

- ☐ Non-polarizing electrodes
- ☐ Magnetic electrodes
- ☐ Electrolytic electrodes
- ☐ Polarizing electrodes

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The detailed X-ray images of the slices of the body is obtained by means of
(1 Point)

- ☐ Scintillation detector arrays
- ☐ Computerized axial tomography
- ☐ Fluoroscopy
- ☐ MRI

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Recording of the peripheral nerves action potential is called _____.
(1 Point)

- ☐ Electroencephalography
- ☐ Electrocardiography
- ☐ Electronervegraphy
- ☐ Electroneurography
- ☐ Electrocardiography

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Match the following:
(1 Point)

i. Below 3 Hz	a. alpha
ii. From 3 Hz to about 7 Hz	b. beta
iii. From 8 Hz to 13 Hz	c. theta
iv. Above 13 Hz	d. delta

- ☐ i-d, ii-a, iii-c, iv-b
- ☐ i-c, ii-b, iii-a, iv-d
- ☐ i-c, ii-d, iii-a, iv-b
- ☐ i-d, ii-c, iii-b, iv-a
- ☐ None of these

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(1 Point)

In an X-ray tube, accelerating potential is 70 kV. Determine the shortest wavelength X-ray produced

(Assume Planck's constant $h = 6.626 \times 10^{-34}$ Js, charge of an electron $e = 1.6 \times 10^{-19}$ coulomb, velocity of light $C = 3 \times 10^8$ m/s)

- ☐ 0.0177 nm
- ☐ 0.0133 nm
- ☐ 0.0144 nm
- ☐ 0.0166 nm

15

Following are the characteristic of an ideal op-amp except
(1 Point)

- ☐ Zero slew rate
- ☐ Infinite bandwidth
- ☐ Zero output impedance
- ☐ Infinite input impedance
- ☐ Zero input offset voltage

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Which of the following statements about X-ray is incorrect?
(1 Point)

- ☐ X-rays are electromagnetic waves of short wave length
- ☐ X-rays produce ionization in gas
- ☐ X-rays are more penetrating than cathode rays
- ☐ X-rays are deflected by electrical and magnetic field

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A Differential Amplifier amplifies
(1 Point)

- ☐ Input signal with higher voltage
- ☐ Sum of the input voltage
- ☐ None of the mentioned
- ☐ Input voltage with smaller voltage

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Diathermy principal is mainly used for _____ purposes
(1 Point)

- ☐ Diagnostic and surgical
- ☐ Therapeutic and Diagnostic
- ☐ Diagnostic and rehabilitative
- ☐ Surgical and Therapeutic

19

In B-scanning, an anatomical sectional image is obtained by
(1 Point)

- ☐ Moving the transducer in the horizontal direction only
- ☐ Moving the transducer over the whole surface
- ☐ Intensity modulation of the electron beam by the amplitude of echoes
- ☐ Frequency modulation of the electron beam by the amplitude of the echoes

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In addition to measuring mean flow speed of the blood, the pulsed Doppler ultrasonic blood flowmeter also displays
(1 Point)

- ☐ Electrical conductivity of the blood
- ☐ Size of the blood vessel
- ☐ Velocity profile
- ☐ Number of red cells per unit volume

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Sensitivity means the change in the output due to the change in input. However, the resolution means
(1 Point)

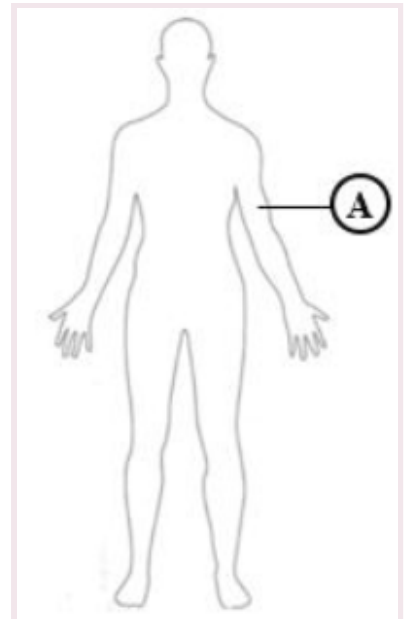
- ☐ the maximum difference that will exist between the actual value
- ☐ the same output again and again for the same input
- ☐ how accurate the output is
- ☐ smallest detectable change in the output
- ☐ None of these

22

In case of stable total AV block, a pacemaker is chosen
(1 Point)

- ☐ that is ventricular synchronous
- ☐ that is atrial synchronous
- ☐ with variable frequency and synchronous with ventricular action
- ☐ with constant frequency

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Consider the following skeleton of human body. At **A** we will record
(1 Point)

- ☐ EMG
- ☐ EOG
- ☐ ECG
- ☐ EEG

To avoid electrode polarization and bio-potential artifacts, electromagnetic blood flowmeters are using
(1 Point)

- ☐ a.c. magnetic fields
- ☐ d.c. current
- ☐ d.c. magnetic fields
- ☐ circular magnets

(1 Point)

In Artificial kidney, dialysate consists of _____

- i. Sodium
- ii. Potassium
- iii. Iron
- iv. Carbon
- v. Magnesium
- vi. Manganese
- vii. Chlorine
- viii. Sulphur
- ix. Phosphorus
- x. Calcium

☐ i, ii, v, vii, x

☐ ii, iii, ix, x

☐ i, iii, viii, ix

☐ vi, vii, ix

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The blood pressure is sensed in vessel just under the skin using a needle in
(1 Point)

- ☐ Catheterization
- ☐ Radiology
- ☐ Implantation
- ☐ Percutaneous

27

What principle does pulse oximetry follow?
(1 Point)

- ☐ Law of Adsorbance
- ☐ Bragg's law
- ☐ Beer – Lambert Law
- ☐ Law of Reflection
- ☐ Law of Irradiance

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State TRUE or FALSE:
With respect to MRI, fat has a short T1 and short T2 compared to liquids/water
(1 Point)

- ☐ TRUE
- ☐ FALSE

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The time interval between two successive R peaks in ECG is 0.8 second. Then the heart rate is
(1 Point)

- ☐ 90 bpm
- ☐ 12.5 bpm
- ☐ 75 bpm
- ☐ 65 bpm
- ☐ 72 bpm

30

An ultrasound camera is used for imaging an object at a distance of 30 m on a windy day flowing with a speed of 10 m/sec in the direction of the propagation of the sound wave, then the sensor detects the first pulse after (speed of sound in air is 340 m/sec)
(1 Point)

- ☐ 0.176 sec
- ☐ 1.76 sec
- ☐ 0.091 sec
- ☐ 0.085 sec

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A high school student began to smoke more heavily. He felt on occasions that his heart "stopped". No treatment was given but the student was advised to give up smoking. The above kind of heart defect is due to
(1 Point)

- ☐ Ventricular fibrillation
- ☐ Improper working of SA node
- ☐ Atrial fibrillation
- ☐ Defect in the heart valve

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The use of superconducting magnets in MRI is to obtain
(1 Point)

- ☐ Signals from surface tissues
- ☐ High strength gradient fields
- ☐ High strength magnetic field
- ☐ High R.F. fields

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