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BITS PILANI DUBAI CAMUS

DUBAI INTERNATIONAL ACADEMIC CITY, DUBAI

MEDICAL INSTRUMENTATION - INSTR C481/INSTR F432/EEE F432

COMPREHENSIVE EXAMINATION

Date: 31-12-13

Max. Marks:40

Time: 3 HRS

Weightage:40%

Answer ALL Questions

All Questions Carry Equal Marks

1. (a) You are to measure blood pressure of a dog during heavy exercise on a treadmill by using a catheter type resistance gage transducer. What is the desirable frequency response for the whole system. Suggest the entire block diagram of the measurement.

(b) Design the circuit for detecting Systolic and Diastolic pressures. Explain the same.
2. (a) Draw the spirogram and mark the following: Vital capacity (VC), Total lung capacity (TLC), Tidal volume (TV) and Residual volume (RV).
(b) Suggest and design a system to measure lung volume changes during breathing.
3. (a) Flow resistance pneumotachometer is a device which translates the flow into differential pressure. Using this device design an instrument to measure and record the respiratory activity.
(b) What is a 10-20 system of electrode placement. Explain in detail.
4. (a) Design the block diagram of a three channel frequency division multiplexed radio telemetry system for transmission of the following signals from a patient being brought in an ambulance (i) Heart rate (ii) ECG (iii) Temperature.

(b) Explain 10-20 system of electrode placement to record EEG. Show the placement of electrodes.
5. Design a system for using EMG from an intact muscle to aid in the control of stimulation of the paralyzed limb.

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TEST 2 (OPEN BOOK)

Date: 10-12-13

Max. Marks:20

Time: 50 Mts

Weightage:20%

Answer ALL Questions

All Questions Carry Equal Marks

1. What is a cardio tachometer. Design and explain the design of a cardio tachometer using ECG as the source signal.
2. Design a noninvasive system for measuring the velocity of propagation of a blood pressure wave from the aortic valve in the heart to the radial artery on the wrist. Describe the sensors, placement and expected waveform.
3. Design the block diagram of photo plethysmography system to monitor heart rate or blood flow.
4. Design the block diagram of a digital spirometer.

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TEST -1(CLOSD BOOK)

MEDICAL INSTRUMENTATION- INSTR C481 / INSTR F 432 /EEE F432

DATE: 7-10-2013

MAX MARKS: 25

TIME: 50 MTS

WEIGHTAGE: 25%

Answer ALL Questions

All Questions Carry Equal Marks

1. A patient with neuromuscular disorder tries to hold an object with his right hand. As a biomedical engineer you are asked to measure the pressure he exerts on the object. Suggest the design of a sensor to measure pressure.
2. Differentiate between ECG, EEG and EMG bringing out salient features.
3. (a) Draw the equivalent circuit of a single bio electrode and two electrodes equivalent and explain.
(b) Suggest and explain an electrode that can overcome motion artifact seen in bio potential electrode.
4. (a) Differentiate between Systolic and Diastolic pressures.
(b) Explain the characteristics of blood flow. Define Stroke volume, mean circulation time and mean velocity.
5. In the harmonic analysis of the following wave forms, what range of frequencies could be expected. Explain in detail.
ECG, EEG, Phonocardiogram, Blood pressure wave.

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QUIZ 2

MEDICAL INSTRUMENTATION – INSTR 0401/EEE 0402/INSTR E432

DATE: 21-11-2013

MAX. MARKS: 7

TIME: 20 MTS

WEIGHTAGE: 7%

Answer ALL Questions

1. Name the various Leads configurations to record the 12 sets of ECG.

2. Draw the circuit for an instrumentation amplifier and give the expressions for overall gain.

3. Draw the block diagram of an ECG isolation preamplifier .

4. What are the conditions for the design of pressure transducers for medical applications.

5. Briefly explain TWO methods of direct measurement of blood pressure.

6. Explain blood flow measurement by thermal convection.

7. What is Impedance plethysmography. Differentiate between TWO electrode and FOUR electrode systems.