BITS PILANI DUBAI CAMPUS

DUBAI INTERNATIONAL ACADEMIC CITY

COMPREHENSIVE EXAMINATION

MEDICAL INSTRUMENTATION -- EEE C481

DATE : 31-12-2012 MAX. MARKS: 40

TIME : 3 Hrs WEIGHTAGE: 40%

Answer ALL Questions

All Questions Carry Equal marks

1. (a) Explain bipolar limb leads. Show ECG in all leads of this configuration.
   (b) 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.

2. (a) What do you understand by fibrillation and how is it corrected. Draw the circuit of a direct current defibrillator and explain.
   (b) Design the cardiology department of a small hospital to include facilities for intensive care monitoring, surgery and diagnostics. Specify all equipment and instrumentation necessary.

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. You want to determine the concentration of sugar in tea by using the human taste sense. How would you set up the experiment. Explain the transduction of taste to electrical signal.

5. Design an instrumentation system for recording pressure, temperature and percentage of oxygen in inspired air coming from continuous positive airway pressure device for use with new borns.

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TEST 2 (OPEN BOOK)

MEDICAL INSTRUMENTATION -- EEE C481

DATE : 22-11-2012 MAX. MARKS: 20

TIME : 50 MTS WEIGHTAGE: 20%

Answer ALL Questions

All Questions Carry Equal marks

1. Design an ECG amplifier to have a overall gain of 1000. The amplifier should also be able to filter out the frequencies above 500 Hz. Show the full circuit diagram with designed values.

2. Design the block diagram of an ultrasonic blood flow meter and explain all the relevant factors considered in the design. Give all the specifications of all the blocks used.

3. Design the block diagram of a circuit that will detect QRS complex of ECG even when the amplitude of the T wave exceeds that of QRS complex.

4. Design the block diagram of a radio telemetry system using frequency modulation capable of transmitting and receiving ECG, EEG and EMG. Use frequency multiplexing.

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TEST 1(CLOSED BOOK)

MEDICAL INSTRUMENTATION -- EEE C481

DATE : 4-10-2012 MAX. MARKS: 25

TIME : 50 MTS WEIGHTAGE: 25%

Answer ALL Questions

1. With reference to a medical instrumentation system explain the following: Frequency response, Isolation, Effect of transducer on measurement, Artifacts, Safety considerations. (5M)

2. Explain FOUR methods of measurements of Force. (5M)

3. Describe the various changes that occur in the EEG during sleep. Give the frequency ranges of EEG. (5M)

4. Draw the equivalent circuit with the bio potential electrode interface. Explain the same. (5M)

5. What are the different characteristics of blood flow. Explain. (5M)

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QUIZ 2

MEDICAL INSTRUMENTATION -- EEE C481

DATE : 13-12-2012 MAX. MARKS: 7

TIME : 20 MTS WEIGHTAGE: 7%

1. Give the values of the following lung volumes and capacities.
   Total lung capacity, Residual volume, Vital capacity and Inspiratory reserve volume.

2. Define Respiratory minute volume and Forced vital capacity.

3. Draw the spirogram and mark the following: IRV, IC, FRC and VC.

4. Differentiate between sympathetic and parasympathetic systems.

5. State the requirements for neuronal firing measurements.

6. EMG signal can be quantifies in several ways. What are they.

7. Explain the two different ways of using EMG biofeedback.

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QUIZ 1(CLOSED BOOK)

MEDICAL INSTRUMENTATION -- EEE C481

DATE : 23-10-2012 MAX. MARKS: 8

TIME : 20 MTS WEIGHTAGE: 8%

1. (i) The mean pressure in some arteries can be as much as _____ higher than in the aorta.
   (ii) Pressure in the arterioles can vary from about _____ down to _____.
2. A patient has a cardiac output of 4 ltr/min, a heart rate of 86 beats/min and a blood volume of 5 ltr/min. Calculate stroke volume and mean circulation time.

3. Draw the heart sound waveforms during (i) Aortic stenosis (ii) Aortic regurgitation (iii) Mitral stenosis (iv) Normal state.

4. Give the normal values of (i) Amplitudes of P, R, Q, T waves (ii) Duration of PR, QT, P and QRS.

5. Show the ECG waveforms in Lead I, aVR , V_1 and V_6.

6. Draw the circuit diagram of an ECG amplifier.

7. State the principle of FOUR methods of direct blood pressure measurement.

8. What are the disadvantages of using semiconductor strain gages in pressure measurement.