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B. Tech 7th Semester Examination

Bio-Medical Engineering (NS)

EE-413

Time : 3 Hours **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Question Paper consists of 5 sections. Attempt five questions selecting one question each from sections A, B, C and D. All Questions in Section E are compulsory.

SECTION - A

1. (i) Explain the general block diagram of a medical instrumentation system. (10)

   (ii) Evaluate the various constraints in design of medical instrumentation system. (10)

2. (i) Illustrate the typical features of (a) Limb Electrode (b) Pasteless Electrodes. (10)

   (ii) How are bioelectric signals generated in human body? Illustrate with the help of a diagram, the electric activity associated with one contraction in a muscle. (10)

SECTION - B

3. (i) Describe the working of LVDT with diagram, showing detection of differential signals. (10)

   (ii) Discuss the role of optical fiber sensors in medical field. Also figure out the basic features of the various types of optical sensors. (10)

4. (i) What are limitations of differential amplifier? How does instrumentation amplifier is capable of overcoming those limitations? Discuss with the aid of schematic diagram. (10)

   (ii) Elaborate the general considerations for signal conditioners. (10)

SECTION - C

5. (i) Why Biofeedback is very significant for gaining control of various body processes? (10)

   (ii) Illustrate the working principle of computerized axial tomography. Compare it with conventional X-rays. (10)

6. Draw and explain the block diagram of EEG machine with both analog and digital components. (20)

SECTION - D

7. (i) Draw and explain the basic block diagram of X-ray machine sub-systems. (10)

   (ii) Discuss the various physical parameters for X-ray detectors. (10)

8. (i) Describe in detail about the nature, production and visualization of X-rays. (10)

   (ii) Write Technical notes on (a) Dental X-ray machines (b) Portable/Mobile X-ray units. (10)

SECTION - E

9. (i) Distinguish between voluntary standards v/s. mandatory standards for medical devices.

(ii) Differentiate between bioelectric and biomechanical signals.

(iii) How microelectrodes have very high impedance as compared to conventional electrodes?

(iv) Write the significance of skin contact impedance.

(v) List the various static characteristics of transducers.

(vi) How wavelet transform is capable of providing multiresolution analysis?

(vii) Compare crystal vs. dynamic type microphone used for recording phonocardiogram.

(viii) Write properties of X-rays that makes them suitable for purpose of medical diagnosis.

(ix) Point out the specifications of typical mammographic X-ray equipment

(x) What is the fundamental difference between spiral CT and conventional CT? (10×2=20)