Printed Pages—4 TEE031

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 0290 Roll No. | | | | | | | | | | |

B. Tech.

(SEM. VIII) THEORY EXAMINATION 2010-11

BIO-INSTRUMENTATION

Time : 3 Hours *Total Marks : 100*

Note : Attempt **all** questions. Each question carries equal marks.

1. Answer any **four** parts of the following : (5×4=20)

   (a) Discuss 10 most important factors to consider in the design and application of a medical instrumentation system.

   (b) What are three basic differences that contribute to communication problems between the physician and the engineer ? How can they be overcome ?

   (c) What are the objectives of a bio-instrumentation system ? Discuss.

   (d) What specific features might be incorporated into an instrument designed for clinical use as opposed to one designed for research purposes ?

   (e) Explain the difference between isometric and isotonic transducers.

   (f) What is a mercury strain gauge ? Describe its operation and list as many biomedical applications as you can.

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2. Answer any two parts of the following : (10×2=20)

(a) What is a biopotential ? Name [illegible] sources. How are the potentials [illegible] fibers measured, and what is the record called [illegible] therefrom ?

(b) What are the problems involved in using flat electrodes in terms of interference or high impedance between electrode and skin ? How could you help eliminate this problem ? What are the major advantages of floating type skin surface electrodes ?

(c) Explain the operation of the heart and the cardiovascular system briefly. Draw an analogous electric circuit and show how Ohm's Law and Kirchoff's Laws could apply in the analog. Draw the waves shape of blood pressure on a time base and explain it. What is the dicrotic notch ?

3. Answer any two parts of the following : (10×2=20)

(a) What is the difference between afferent and efferent nerves ? What is a neuronal spike ? Draw a typical spike showing amplitude and duration. Explain the way in which a neuronal spike is tranmitted from one neuron to another.

(b) What is the spiral reflex and how is it related to the functions of the brain ? Explain the function of :

(i) Carebral cortex

(ii) Cerebellum

(iii) Retiarlar activation system

(iv) Hypothalamus.

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(c) Explain the technique of thermography. Comment on its usefulness. Why is skin surface temperature lower than systemic temperature measured arally ? What is meant by "Ultrasonic imaging" ?

4. Attempt any **two** parts of the following: **(10×2=20)**

(a) Enlist advantages and disadvantages of biotelemetry. Draw a block diagram of a system to send an electrocardiogram from an ambulance to a hospital by telemetry.

(b) Design a coronary-care hospital suite. Show all rooms in a layout plan. Illustrate all your instrumentation systems by block diagrams. Discuss warning devices to be used in Intensive-care Units.

(c) Discuss instrumentation and methods for rapid diagnosis and repair of instrumentation in an intensive-care unit. What equipment would you need in a diagnostic catheterization laboratory ?

5. **Answer any two of the following :** **(10×2=20)**

(a) What is the principal difference between X-ray and radioisotope methods for diagnostic purposes ? Describe the principle of visualizing body organs by radioisotope methods.

(b) What is the purpose of a parallel to serial converter in bio-instrumentation system ? When would such a device be used ? Explain the principle of computerized axial tomography and compare its method of visualization with conventional X-ray methods.

(c) Explain the two different ways in which electricity can harm the body. What is the basic purpose of the safety measures used with electrically susceptible patients ? Why is it so important to maintain the integrity of the grounding system for protection against microshock ?