

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Chaitra

Exam.	Regular / Back		
	Level	BE	Full Marks
Programme	BEX, BCT	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Biomedical Instrumentation (*Elective I*) (EX72503)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
 - ✓ Attempt All questions.
 - ✓ The figures in the margin indicate Full Marks.
 - ✓ Assume suitable data if necessary.
1. a) Explain man-instrument system with its five objectives. What are the most indispensable system components required for man-instrument system to transmit an ECG and HR signals of a patient who is being medically evaluated to the better center after some serious accident at a remote place? Complete a schematic lay-out diagram showing the information flow between a mobile unit and a base unit. [8]
 - b) What is ventricular fibrillation? Is it caused by physiological effects of electric current than how? Give some reasons. Design a DC Defibrillator machine to restore the normal cardiac rhythm and explain its function briefly. [8]
 2. a) How a transmitter circuit discharges a capacitor through the crystal of a piezo-electric transducer to generate large amplitude of pulses? How these pulses are utilized to view internal structures of the human body? Compare A-mode and b-mode display format. [8]
 - b) Describe electrode theory. Draw an equivalent circuit of both electrode and transducer. What type of transducer is used in ultrasonic bloodflow meter? Explain its function with necessary diagram. [8]
 3. a) What is Computer Tomography? How 'profiles are acquired for better resolution in image reconstruction technique in CT? Explain with schematic block diagram. What are the differences between CT and X-ray machine? Explain some biological effects of x-rays. [10]
 - b) Draw a set of 12 leads ECG recording configuration with proper connection diagram. What types of electrodes are used to record ECG? [6]
 4. a) How dialyrate fluid is used with RO water in mixing chamber to artificial kidney during dialysis? Draw a lay-out diagram of Electro-Hydraulic based ESWL with its required major components. [8]
 - b) What are the system components of MRI? Explain Image Detection system with its function and application. Give four differences of MRI with CT-scan machine. [8]
 5. a) What is leakage currents? How a Heart patient who is under catheterization procedure is protected from the leakage current? Assume the values of leakage current and patient resistance with suitable ground wire for proper grounding. [8]
 - b) Write short notes on: (Any two) [4+4]
 - (i) Resting and Action Potentials
 - (ii) EEG Recorder
 - (iii) Electromyography