26J TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Ashwin

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEX	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Bio-Medical 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) Differentiate invasive and non-invasive instrumentation system. Explain the problems while measuring a living system. Provide the possible solutions to overcome the problems encountered. [8]

   b) Why is Membrance polarized at rest? Explain the different types of bio-potential electrodes along with the equivalent circuit of bio-potential electrode interface. [8]

2. a) Define piezoelectricity. Explain the piezoelectric transducer with output wave diagrams. List the biomedical applications of piezoelectric transducer. [8]

   b) Define Einthoven's law. Explain the 12-lead ECG configurations with suitable diagrams. [8]

3. a) Define steady state visual evoked potential. Explain the different types of brain waves in normal EEG. List out the use and benefits of EMG. [8]

   b) Describe the ultrasonic blood flow meter. Explain the operation of X-ray machine with its functional diagram. List out the applications of X-ray. [8]

4. a) Differentiate between Cardiac Pacemaker and Defibrillator. Explain dialyzer and its type with clear diagrams. [8]

   b) Describe the frequency division multiple channel telemetry system. Draw the architecture of telemedicine showing the telemedicine unit and base unit. [8]

5. Write short notes on: [4×4]

   i) Principle of MRI and NMR
   ii) CT-Scan Machine
   iii) Electrical distribution system in hospital
   iv) Leakage current and its type

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Ashwin

Exam.	Back		
Level	BE	Full Marks	80
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 <u>All</u> questions.*
- ✓ *The figures in the margin indicate <u>Full Marks</u>.*
- ✓ *Assume suitable data if necessary.*

1. a) Differentiate invasive and non-invasive instrumentations system. Explain the different problems encountered while measuring a living system. [8]
   b) Define Nerst Equation. Describe Polarization, Depolarization and Repolarization with suitable diagram. [8]
2. a) Define Einthoven's law. Describe ECG waveform. Explain three unipolar limb leads and six unipolar chest lead configurations for ECG measurement. [8]
   b) Define evoked potential. Describe three muscle related diseases. Explain the different types of brain waves in normal EEG. [8]
3. a) Define ultrasound. How X-ray machine differs from CT-scan machine? Explain the scanning and processing system of CT-scan machine with complete diagrams. [8]
   b) What is defibrillator machine? Differentiate between cardiac pacemaker and defibrillator machine. Describe different types of dialyzers. [8]
4. a) Draw the architecture of Telemedicine. Describe the elements of telemetry system. Explain single channel radio telemetry system. [8]
   b) What are the advantages and disadvantages of electromagnetic blood flow meter? Explain electromagnetic blood flow meter with diagram. [8]
5. Write short notes on: [4×4]
   a) Leakage current and Protection system
   b) Medical Instrumentation system
   c) Strain guage
   d) Magnetic Resonance Imaging

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36 J TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Ashwin

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEX	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) Define the terms biomedical engineering and biometrics. Discuss about the factors to be considered to design the medical instruments. [2+6]
   b) List various classes of bio-potential electrodes and describe about the construction and operation of micro-electrodes. [8]
2. a) What are active and passive transducers? Discuss about the operation piezoelectric active transducer used in medical field. [2+6]
   b) What is ECG? Describe about the various leads of the ECG equipment. [2+6]
3. a) What do you mean by EMG? Draw and explain about the functional blocks of EMG machine. [8]
   b) Discuss about the Lithotripsy and its principles. Also list the application of the lithotripter Machine. [8]
4. a) Discuss about the function of the ultrasonic blood-flow meter with the appropriate block-diagram. [8]
   b) Draw and explain about operation of MRI-Machine. [8]
5. Write short notes on: (Any four) [4×4]
   a) Multichannel Telemetry
   b) Telemedicine through mobile communication
   c) Micro and Macro-electric shocks
   d) Protection of the current susceptible patient in hospitals
   e) X-Ray generation

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26J TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
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) Show the differences between electroencephalograph and electrocardiograph. Design an ECG system for the 12 leads recording configuration. Show the connection diagram of three augmented limb leads. [8]

   b) What is transducer? Classify different types of transducer in respect to medical application. Discuss the performance characteristics of transducer in detail. [8]

2. a) What is ultrasonography? Explain basic pulse echo apperatus with its transmitter circuit. State applications of both A mode and B mode display format. [10]

   b) What is Cardiac Fibrillation? How you detect it? Design DC defibrilater machine to restore ECG. [6]

3. a) Explain the working physical principles of all the blood flow meters available and used in medical application. Describe briefly magnetic blood flow meter. [8]

   b) How dialysate is used with medical grade water in mixing chamber to flow properly in exchange chamber of dilyzer during dialysis procedure? Draw a layout diagram of ESWL based on electro-hydraulic method with complete major components. [8]

4. a) Show the differences between computer tomography and magnetic resonance imaging technique with complete schematic diagram. Compare the working principle of both techniques used in diagnosis with help of image reconstruction. Discuss the applications separately. [10]

   b) What are the difference between macro shock and micro shock? Discuss physiological effects of electricity. [6]

5. Write short notes on: (any two) [8+8]

   i) Telemedicine using mobile communication
   ii) Resting potential and action potential
   iii) EEG recording technique and its instrument

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