SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

Approved by AICTE, Affiliated to Anna University, Chennai, Accredited by NBA,

'A' Grade Accreditation by NAAC & ISO 9001:2015 Certified Institution

SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION ENGINEERING

VII SEMESTER

1907703 – Biomedical Instrumentation

Regulation - 2019

Academic Year 2025 - 2026 (Odd Sem)

s

Prepared by

Ms. M. Shanthi, Assistant Professor / EIE

SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

Approved by AICTE, Affiliated to Anna University, Chennai, Accredited by NBA,

'A' Grade Accreditation by NAAC & ISO 9001:2015 Certified Institution

SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION ENGINEERING

QUESTION BANK

SUBJECT: 1907703 – Biomedical Instrumentation

SEM/YEAR : VII/IV

UNIT I – FUNDAMENTALS OF BIOMEDICAL ENGINEERING

Cell and its structure – Resting and Action Potential – Nervous system and its fundamentals - Basic components of a biomedical system- Cardiovascular systems- Respiratory systems – Kidney and blood flow - Biomechanics of bone - Biomechanics of soft tissues -Physiological signals and transducers - Transducers – selection criteria – Piezo electric, ultrasonic transducers - Temperature measurements - Fibre optic temperature sensors.

PART - A

Q. No	Questions	BT Level	Competence	Course Outcome
1.	What does the term "cell" refer to?	BTL1	Remembering	CO 1
2.	What is bioelectric potential?	BTL1	Remembering	CO 1
3.	Define half cell potential.	BTL1	Remembering	CO 1
4.	Differentiate action potential and resting potential.	BTL2	Understanding	CO 1
5.	Write down the Nernst equation for electrode potential.	BTL2	Understanding	CO 1
6.	Distinguish absolute and relative refractory period.	BTL2	Understanding	CO 1
7.	State ALL-OR-Nothing law.	BTL1	Remembering	CO 1
8.	Distinguish between Tidal Volume (TV) and Residual Volume (RV).	BTL2	Understanding	CO 1
9.	What is the function of the 'nervous system' and what are its parts?	BTL2	Understanding	CO 1
10.	Name the components of a biomedical system.	BTL1	Remembering	CO 1
11.	Name the four valves associated with the functioning of the heart.	BTL1	Remembering	CO 1
12.	Mention the functions of Circulatory System.	BTL2	Understanding	CO 1
13.	Mention the functions of kidney.	BTL2	Understanding	CO 1
14.	State WOIFF's law.	BTL1	Remembering	CO 1
15.	What is soft tissue injury?	BTL1	Remembering	CO 1
16.	Mention various physiological signals.	BTL2	Understanding	CO 1
17.	Define transducer.	BTL1	Remembering	CO 1
18.	Mention the factors considered while selecting a transducer.	BTL2	Understanding	CO 1
19.	Differentiate active and passive transducers.	BTL2	Understanding	CO 1
20.	Write the principle of Piezo electric transducer.	BTL2	Understanding	CO 1
21.	Write the principle of Ultrasonic transducer.	BTL2	Understanding	CO 1
22.	List out different types of temperature transducers for measurement of temperature in medical field.	BTL1	Remembering	CO 1
23.	List the types of fibre optic sensors with examples.	BTL1	Remembering	CO 1
24.	What are the advantages of optical fibre sensors over other types of sensors?	BTL2	Understanding	CO 1

	PART - B				
1.	Sketch the structure of human cell and explain its constituents.	**(13)**	BTL3	Applying	CO 1
2.	With a typical cell potential waveform, examine the relationship between the action potential and muscle contraction.	**(13)**	BTL3	Applying	CO 1
3.	Explain the mechanism of generation of action potential and write the necessary equations and mention different stages of action potential	**(13)**	BTL4	Analyzing	CO 1
4.	Examine the different parts of the central nervous system and their activities.	**(13)**	BTL3	Applying	CO 1
5.	Sketch the block diagram of biomedical instrumentation system and explain the functions of each block.	**(13)**	BTL3	Applying	CO 1
6.	Draw the layout of Cardiovascular system and explain its functionality in detail.	**(13)**	BTL4	Analyzing	CO 1
7.	With neat sketch explain the function of human respiratory system in detail.	**(13)**	BTL4	Analyzing	CO 1
8.	With neat sketch explain the function of kidney in detail.	**(13)**	BTL4	Analyzing	CO 1
9.	Examine biomechanics of bone with its characteristics.	**(13)**	BTL3	Applying	CO 1
10.	Examine biomechanics of soft tissues with its characteristics.	**(13)**	BTL3	Applying	CO 1
11.	Classify transducers based on **(i)** physical effect employed **(ii)** physical quantity they convert **(iii)** source of energy for their output	 **(5)** **(4)** **(4)**	BTL3	Applying	CO 1
12.	Examine the following static characteristics of a transducer: **(i)** Accuracy and Precision, **(ii)** Sensitivity and Linearity, **(iii)** Resolution and Threshold.	 **(5)** **(4)** **(4)**	BTL3	Applying	CO 1
13.	Illustrate the principle of operation of piezoelectric transducers.	**(13)**	BTL3	Applying	CO 1
14.	Illustrate the principle of operation of ultrasonic transducers.	**(13)**	BTL3	Applying	CO 1
15.	How does the piezoelectric transducer produce ultrasonic waves? Create its electric equivalent near resonance for longitudinal elastic waves along thickness (LET) mode.	**(13)**	BTL4	Analyzing	CO 1
16.	Write short notes on: **(i)** Systematic Body Temperature Measurement. **(ii)** Skin Temperature Measurement.	 **(7)** **(6)**	BTL3	Applying	CO 1
17.	Explain the working of a fibre optic temperature sensor in biomedical with neat sketch.	**(13)**	BTL4	Analyzing	CO 1
	PART – C				
1.	Name the three major parts of the brain and explain their working.	**(15)**	BTL4	Analyzing	CO 1
2.	With the action potential waveform summarizes depolarization, repolarization and absolute and relative refractory periods.	**(15)**	BTL5	Evaluating	CO 3
3.	Analyze the factors that are to be considered in the selection of a transducer	**(15)**	BTL3	Applying	CO 1
4.	What are the requirements of a good physiological transducer and explain the operation of any two types of physiological transducers with relevant sketches?	**(15)**	BTL4	Analyzing	CO 1
5.	Derive expression for gauge factor and express piezo-resistivity in terms of gauge factor.	**(15)**	BTL4	Analyzing	CO 1

UNIT II - NON ELECTRICAL PARAMETERS MEASUREMENT AND DIAGNOSTIC PROCEDURES

Measurement of blood pressure - Cardiac output - Heart rate - Heart sound – Pulmonary function measurements – spirometer – Photo Plethysmography, Body Plethysmography – Blood Gas analysers, pH of blood –measurement of blood pCO2, pO2, finger-tip oxymeter - ESR, GSR measurements.

PART - A

Q. No.	Questions	BT Level	Competence	Course Outcome
1.	Differentiate Systolic pressure and Diastolic pressure.	BTL2	Understanding	CO 2
2.	List the methods of Blood Pressure measurement.	BTL1	Remembering	CO 2
3.	What is Korotkoff sound?	BTL1	Remembering	CO 2
4.	Define cardiac output.	BTL1	Remembering	CO 2
5.	List the methods to measure cardiac output.	BTL1	Remembering	CO 2
6.	What are the causes of Cerbo Vascular Accident (CVA)?	BTL2	Understanding	CO 2
7.	Write the normal heart rate of human being according to age group.	BTL2	Understanding	CO 2
8.	What is Phonocardiogram and Phonocardiograph?	BTL1	Remembering	CO 2
9.	Classify the four categories of Heart sound.	BTL2	Understanding	CO 2
10.	Differentiate between heart sound and murmurs.	BTL2	Understanding	CO 2
11.	Mention common pulmonary function measurements?	BTL2	Understanding	CO 2
12.	What is the use of Spirometer?	BTL1	Remembering	CO 2
13.	List various types of Spirometer.	BTL1	Remembering	CO 2
14.	State Boyle's law.	BTL1	Remembering	CO 2
15.	Write Fick's principle.	BTL2	Understanding	CO 2
16.	Write the principle of blood gas analyzer.	BTL2	Understanding	CO 2
17.	Give the normal value of pH, pCO_2, pO_2 in human blood.	BTL2	Understanding	CO 2
18.	Define pH.	BTL1	Remembering	CO 2
19.	What is dead air?	BTL1	Remembering	CO 2
20.	Write the equation for anode, cathode reaction in pO_2 electrode.	BTL2	Understanding	CO 2
21.	What is the use of oxymeters? Classify the types of oxymeters.	BTL2	Understanding	CO 2
22.	Write the range of LED's used fingertip oximeter.	BTL2	Understanding	CO 2
23.	What is meant by ESR and GSR?	BTL1	Remembering	CO 2
24.	List the methods to measure GSR.	BTL1	Remembering	CO 2

PART – B

1.	Explain any one method of direct blood pressure measurement with a typical setup.	**(13)**	BTL4	Analyzing	CO 2
2.	Illustrate the principle of blood pressure measurement based on Korotkoff sounds	**(13)**	BTL3	Applying	CO 2
3.	Explain the Rheographic method of indirect blood pressure measurement with neat sketches.	**(13)**	BTL4	Analyzing	CO 2
4.	Explain Oscillometric method for blood pressure measurement in detail.	**(13)**	BTL4	Analyzing	CO 2
5.	Explain Ultrasonic Doppler Shift Method of blood pressure measurement.	**(13)**	BTL4	Analyzing	CO 2
6.	What is the principle of 'Indicator Dilution Method' for measurement of cardiac output? Explain the working of dye dilution method.	**(13)**	BTL4	Analyzing	CO 2
7.	What is thermal dilution method for cardiac output measurement? With the block diagram, illustrate the processing and computing circuit of thermal dilution method for cardiac output.	**(13)**	BTL3	Applying	CO 2
8.	Illustrate the impedance technique for measuring of increasing cardiac output and indicate its advantages.	**(13)**	BTL3	Applying	CO 2

9.	With block diagram, explain Instantaneous Heart Rate Meters.	**(13)**	BTL4	Analyzing	CO 2
10.	Show the arrangement of the transducer used for pulse pick-up. Examine with the help of a block diagram the circuit for processing plethysmographic signal.	**(13)**	BTL3	Applying	CO 2
11.	Explain basic water sealed spirometer for the measurement of pulmonary functions.	**(13)**	BTL4	Analyzing	CO 2
12.	With neat setup, explain plethysmograph to measure the changes in volume in different parts of the body.	**(13)**	BTL4	Analyzing	CO 2
13.	What is the function of a blood gas analyser? Why is it necessary to maintain acid-base balance in the body? Illustrate with a block diagram of a complete blood gas analyser.	**(13)**	BTL3	Applying	CO 2
14.	What is blood pCO_2 and how is it measured? Illustrate the construction of blood pCO_2 electrode.	**(13)**	BTL3	Applying	CO 2
15.	What are oximeter? Examine fingertip oximeter with suitable diagram.	**(13)**	BTL3	Applying	CO 2
16.	What is the principle of working of 'Pulse Oximeter'? What type of transducer is used for pulse oximetry? Explain the signal processing arrangement in a pulse oximeter.	**(13)**	BTL4	Analyzing	CO 2
17.	Explain the measurement and record of basal skin resistance (BSR) and galvanic skin response (GSR) with block diagram.	**(13)**	BTL4	Analyzing	CO 2
	PART – C				
1.	Draw a diagram showing the constructional details of microcapillary electrode for measurement of blood pH. Analyze the effect of blood on the working of the glass electrode and measures taken to minimize the effect?	**(15)**	BTL4	Analyzing	CO 2
2.	Explain Differential Auscultatory Technique for indirect blood pressure measurement with neat sketches.	**(15)**	BTL4	Analyzing	CO 2
3.	Assess a detailed study about diagnosis and treatment of High blood pressure (hypertension).	**(15)**	BTL5	Evaluating	CO 2
4.	Explain fibre optic based blood gas sensor with block diagram.	**(15)**	BTL4	Analyzing	CO 2
5.	Explain the technique for measuring blood pO_2. Draw the construction of blood pO_2 electrode and the circuit diagram for measurement of signal developed at the electrode.	**(15)**	BTL4	Analyzing	CO 2

UNIT III – ELECTRICAL PARAMETERS ACQUISITION AND ANALYSIS

Electrodes – Limb electrodes – floating electrodes – pregelled disposable electrodes -Micro, needle and surface electrodes – Amplifiers, Preamplifiers, differential amplifiers, chopper amplifiers – Isolation amplifier - ECG – EEG – EMG – ERG – Lead systems and recording methods – Typical waveforms - Electrical safety in medical environment, shock hazards – leakage current-Instruments for checking safety parameters of biomedical equipment.

PART - A

Q. No.	Questions	BT Level	Competence	Course Outcome
1.	Classify the various types of electrodes.	BTL2	Understanding	CO 3
2.	List the types of surface electrodes.	BTL1	Remembering	CO 3
3.	Mention the purpose of electrode paste.	BTL2	Understanding	CO 3
4.	Name the electrodes used for EEG measurement	BTL1	Remembering	CO 3
5.	Name the electrodes used for ECG measurement	BTL1	Remembering	CO 3
6.	List the types of amplifiers.	BTL1	Remembering	CO 3
7.	What is preamplifier? State its functional requirements**.**	BTL1	Remembering	CO 3
8.	List the basic requirements for Bio-amplifier.	BTL1	Remembering	CO 3
9.	Give the frequency range & amplitude of ECG, EEG and EMG waves**.**	BTL2	Understanding	CO 3
10.	Write the characteristics of DC amplifier.	BTL2	Understanding	CO 3
11.	Sketch a typical 'PQRST' complex waveform with respect to ECG.	BTL2	Understanding	CO 3
12.	Give the origin, amplitude and duration of the different waves in ECG.	BTL2	Understanding	CO 3
13.	Draw EINTHOVEN TRIANGLE and how it is used in ECG measurement.	BTL2	Understanding	CO 3
14.	Give three types of lead systems used to record electrocardiograms**.**	BTL2	Understanding	CO 3
15.	Give the disadvantages of using surface electrodes with EMG.	BTL2	Understanding	CO 3
16.	List the brain waves and their frequency range.	BTL1	Remembering	CO 3
17.	Define the term LATENCY in EMG**.**	BTL1	Remembering	CO 3
18.	What is ERG?	BTL1	Remembering	CO 3
19.	What are Electrical Shocks? How can they be avoided?	BTL2	Understanding	CO 3
20.	Differentiate micro shock and macro shock.	BTL2	Understanding	CO 3
21.	Define leakage current.	BTL1	Remembering	CO 3
22.	What are the hazards of leakage current?	BTL1	Remembering	CO 3
23.	List the types of leakage current.	BTL1	Remembering	CO 3
24.	What is the use of Ground Fault Interrupter (GFI)?	BTL1	Remembering	CO 3

PART - B

1.	Write short notes on **(i)** Limb electrode **(ii)** Suction cup electrode **(iii)** Floating electrode.	 **(5)** **(4)** **(4)**	BTL4	Analyzing	CO 3
2.	Illustrate the construction of pre-gelled disposable electrodes. Why they are preferred for long term recording of bioelectric signals?	**(13)**	BTL3	Applying	CO 3
3.	Where do we use microelectrodes? What are the types of microelectrodes? Illustrate the construction of a typical metal microelectrode.	**(13)**	BTL3	Applying	CO 3
4.	Illustrate the working of an instrumentation amplifier with the help of a schematic diagram. What are the advantages of instrumentation amplifiers?	**(13)**	BTL3	Applying	CO 3

5.	Illustrate the working of a chopper stabilized operational amplifier. What are the advantages of using this type of amplifier in medical instrumentation?	**(13)**	BTL3	Applying	CO 3
6.	Write short notes on **(i)** Mechanical Chopper amplifier. **(ii)** Nonmechanical Chopper amplifier.	 **(7)** **(6)**	BTL4	Analyzing	CO 3
7.	What is the need of using an 'Isolation Amplifier'? Explain the working of optically isolated isolation amplifier.	**(13)**	BTL4	Analyzing	CO 3
8.	Draw the typical electrocardiogram and examine its physiological nature in detail.	**(13)**	BTL3	Applying	CO 3
9.	What is an ECG 'Lead'? Explain various types of 'Leads' used for recording ECG signal.	**(13)**	BTL3	Applying	CO 3
10.	Explain ECG recorder with its building blocks.	**(13)**	BTL4	Analyzing	CO 3
11.	Explain 10-20 electrode system used in EEG.	**(13)**	BTL4	Analyzing	CO 3
12.	Draw the block diagram of an EEG unit and examine the different parts in it.	**(13)**	BTL3	Applying	CO 3
13.	Write short notes on **(i)** EMG **(ii)** ERG.	 **(7)** **(6)**	BTL4	Analyzing	CO 3
14.	Analyze Electrical safety in medical environment.	**(13)**	BTL4	Analyzing	CO 3
15.	Illustrate the electrical accidents in hospitals due to Microshock and Macroshock hazards.	**(13)**	BTL3	Applying	CO 3
16.	Explain the devices to protect against electrical hazards.	**(13)**	BTL4	Analyzing	CO 3
17.	Analyze the instruments used to check the safety parameters of biomedical equipments.	**(13)**	BTL4	Analyzing	CO 3
	PART - C				
1.	Analyze the problems encountered in measurement of physiological system. Explain how these differ from physical systems.	**(15)**	BTL4	Analyzing	CO 3
2.	Examine the origin of electrical activity of the heart with the help of a diagram. Draw a typical ECG waveform and label it.	**(15)**	BTL3	Applying	CO 3
3.	Elaborate on the medical equipment maintenance and safety parameters in handling it.	**(15)**	BTL4	Analyzing	CO 3
4.	Examine how the electrical hazards protection can be provided in the biomedical instrumentation systems.	**(15)**	BTL3	Applying	CO 3
5.	Analyze the effects of radiation exposure and radiation monitoring instruments.	**(15)**	BTL4	Analyzing	CO 3

UNIT IV – IMAGING MODALITIES AND ANALYSIS

Radio graphic and fluoroscopic techniques – Computer tomography – MRI – Ultrasonography – Endoscopy – Thermography –Different types of biotelemetry systems - Retinal Imaging – Imaging application in Biometric systems.

PART - A

Q. No.	Questions	BT Level	Competence	Course Outcome
1.	Distinguish radiographic and fluoroscopic techniques.	BTL2	Understanding	CO 4
2.	List different types of radiations.	BTL1	Remembering	CO 4
3.	Distinguish Alpha, Beta and Gamma rays.	BTL2	Understanding	CO 4
4.	What is Tomography?	BTL1	Remembering	CO 4
5.	What is Thermography?	BTL1	Remembering	CO 4
6.	What is computer aided tomography?	BTL1	Remembering	CO 4
7.	List the applications of CT.	BTL1	Remembering	CO 4
8.	Mention the applications of Endoscopic technique.	BTL2	Understanding	CO 4
9.	Give the advantages of MRI scan.	BTL2	Understanding	CO 4
10.	What is ultrasonic Tomographic technique?	BTL1	Remembering	CO 4
11.	Mention the application of Endoscopy.	BTL2	Understanding	CO 4
12.	Specify the different modes of Ultrasonagraphy.	BTL2	Understanding	CO 4
13.	Write the principle used in thermographic imaging.	BTL2	Understanding	CO 4
14.	Write the principle behind MRI.	BTL2	Understanding	CO 4
15.	Give the advantages and applications of thermography.	BTL2	Understanding	CO 4
16.	Draw the block diagram of a thermographic equipment and list its components.	BTL2	Understanding	CO 4
17.	What are the methods of thermography?	BTL1	Remembering	CO 4
18.	What is biotelemetry?	BTL1	Remembering	CO 4
19.	Draw the block diagram of a bio-telemetry system and list its components.	BTL2	Understanding	CO 4
20.	What is a single channel radio telemetry system?	BTL1	Remembering	CO 4
21.	What is a multi channel radio telemetry system?	BTL1	Remembering	CO 4
22.	Define Retinal image.	BTL1	Remembering	CO 4
23.	Mention the applications of biotelemetry.	BTL2	Understanding	CO 4
24.	Mention the applications of ultrasound in medical imaging.	BTL2	Understanding	CO 4

PART – B

1.	Sketch a typical functional block diagram of amplitude modulated radio transmitter and receiver and explain.	**(13)**	BTL4	Analyzing	CO 4
2.	Analyze the role of image intensifier in Radiography and Fluoroscopy in detail.	**(13)**	BTL4	Analyzing	CO 4
3.	Examine the production of X-rays in X-ray tube.	**(13)**	BTL3	Applying	CO 4
4.	Explain the various components in X-ray machine in detail.	**(13)**	BTL4	Analyzing	CO 4
5.	Analyze the role of collimator and bucky grid in x-ray imaging.	**(13)**	BTL4	Analyzing	CO 4
6.	Illustrate the construction and working principle of computer tomography.	**(13)**	BTL3	Applying	CO 4
7.	What do you mean by CT? Formulate the mathematical details of obtaining X-ray image in CT?	**(13)**	BTL4	Analyzing	CO 4
8.	With the block diagram explain the principle of operation and working of MRI system.	**(13)**	BTL4	Analyzing	CO 4

9.	Briefly explain the different modes of ultrasonic scanning with suitable diagrams.	**(13)**	BTL4	Analyzing	CO 4
10.	What are the properties of ultrasound and explain how ultrasound can be used for diagnosis?	**(13)**	BTL4	Analyzing	CO 4
11.	Explain the operation of Endoscopy and prepare its clinical applications.	**(13)**	BTL4	Analyzing	CO 4
12.	Explain with the neat block diagram, the principle and image acquisition method of thermography.	**(13)**	BTL4	Analyzing	CO 4
13.	Illustrate the working of multichannel biotelemetry system with block diagram.	**(13)**	BTL3	Applying	CO 4
14.	Analyze how process of obtaining retinal image with neat sketch.	**(13)**	BTL4	Analyzing	CO 4
15.	Examine a Telemetry circuit using a sub carrier also list its advantages.	**(13)**	BTL3	Applying	CO 4
16.	Illustrate single channel telemetry system for transmission of an ECG with block diagram.	**(13)**	BTL3	Applying	CO 4
17.	Explain various modulation techniques used in telemetry system.	**(13)**	BTL4	Analyzing	CO 4
PART – C					
1.	Draw and explain the different components involved in Radiographic and Fluroscopic techniques.	**(15)**	BTL4	Analyzing	CO 4
2.	Illustrate the principle of computerized Axial Tomography and compare it with conventional X-Ray imaging system.	**(15)**	BTL3	Applying	CO 4
3.	What are the four basic modes of transmission of ultrasound? Illustrate briefly.	**(15)**	BTL3	Applying	CO 4
4.	How magnetic resonance imaging system useful in the medical field and explain its operation with relevant sketches.	**(15)**	BTL4	Analyzing	CO 4
5.	Analyze how the various physiological parameters can be monitored and telemetered and usage of telemetry as an emergency tool.	**(15)**	BTL4	Analyzing	CO 4

UNIT V – LIFE ASSISTING, THERAPEUTIC AND ROBOTIC DEVICES

Pacemakers – Defibrillators – Ventilators – Nerve and muscle stimulators – Diathermy – Heart – Lung machine – Audio meters – Dialysers – Lithotripsy - ICCU patient monitoring system – Nano Robots - Robotic surgery – Orthopedic prostheses fixation.

PART – A

Q. No.	Questions	BT Level	Competence	Course Outcome
1.	Differentiate between external pacemaker and implanted pacemaker.	BTL2	Understanding	CO 5
2.	Classify the types of pacemaker based on modes of operation of the pacemakers.	BTL2	Understanding	CO 5
3.	What is the use of defibrillator?	BTL1	Remembering	CO 5
4.	Give the importance of defibrillator protection circuit in ECG recorder.	BTL2	Understanding	CO 5
5.	Distinguish a defibrillator from a pace maker.	BTL2	Understanding	CO 5
6.	State ventricular fibrillation.	BTL1	Remembering	CO 5
7.	What is a ventilator? Give its importance in respiratory failures.	BTL2	Understanding	CO 5
8.	What is meant by transcutaneous electrical nerve stimulator?	BTL1	Remembering	CO 5
9.	What is shortwave diathermy?	BTL1	Remembering	CO 5
10.	What is microwave diathermy?	BTL1	Remembering	CO 5
11.	State the principle of ultrasonic diathermy.	BTL1	Remembering	CO 5
12.	List different electro surgery techniques used in diathermy.	BTL1	Remembering	CO 5
13.	Define Heart Lung Machine.	BTL1	Remembering	CO 5
14.	Name few tests performed using audiometer.	BTL1	Remembering	CO 5
15.	What is the purpose of audiometers?	BTL1	Remembering	CO 5
16.	What is dialysis? What are the three physical processes used in dialysis?	BTL1	Remembering	CO 5
17.	Compare Hemodialysis and Peritoneal dialysis.	BTL2	Understanding	CO 5
18.	What is lithotripsy.	BTL1	Remembering	CO 5
19.	Predict the variables to be monitored by a patient monitoring system.	BTL2	Understanding	CO 5
20.	Classify the divisions in patient monitoring system.	BTL2	Understanding	CO 5
21.	What are Nano robots?	BTL1	Remembering	CO 5
22.	Mention the benefits of Robotic surgery.	BTL2	Understanding	CO 5
23.	What is Orthopedic prostheses fixation?	BTL1	Remembering	CO 5
24.	List different techniques of Orthopedic prostheses fixation.	BTL1	Remembering	CO 5

PART – B

1.	Write short notes on **(i)** Demand pacemaker and **(ii)** Synchronized pacemaker.	**(7)** **(6)**	BTL4	Analyzing	CO 5
2.	State the need for defibrillator. Illustrate the schematic of implantable defibrillator.	**(13)**	BTL3	Applying	CO 5
3.	With neat sketch explain the working of AC defibrillator.	**(13)**	BTL4	Analyzing	CO 5
4.	Draw a circuit diagram of a DC defibrillator and explain its principle of operation.	**(13)**	BTL4	Analyzing	CO 5
5.	Explain the working of pressure and volume controlled ventilator.	**(13)**	BTL4	Analyzing	CO 5
6.	Explain nerve and muscle stimulators with neat sketch.	**(13)**	BTL4	Analyzing	CO 5

7.	Draw the block diagram of a typical electrotherapeutic stimulator and explain in detail.	**(13)**	BTL4	Analyzing	CO 5
8.	Write short notes on **(i)** Short-Wave diathermy. **(ii)** Microwave diathermy.	 **(7)** **(6)**	BTL3	Applying	CO 5
9.	Explain the working of heart lung machine with block diagram.	**(13)**	BTL4	Analyzing	CO 5
10.	With a block diagram of automatic Bekesy audiometer, explain its measurement procedure.	**(13)**	BTL4	Analyzing	CO 5
11.	With a block diagram of automatic Evoked Response audiometer, explain its measurement procedure.	**(13)**	BTL4	Analyzing	CO 5
12.	Illustrate the procedure for the peritoneal dialysis with a suitable diagram.	**(13)**	BTL3	Applying	CO 5
13.	Explain the principle of operation of a dialyser machine.	**(13)**	BTL4	Analyzing	CO 5
14.	Explain the working of lithotripsy with clear schematic diagrams.	**(13)**	BTL4	Analyzing	CO 5
15.	Analyze different parameters used in patient monitoring system in ICCU.	**(13)**	BTL4	Analyzing	CO 5
16.	Examine the nano robots role in biomedical engineering field. Also explain about Nano robotic surgery.	**(13)**	BTL3	Applying	CO 5
17.	Write short notes on Prosthetics and Orthotics.	**(13)**	BTL3	Applying	CO 5
	PART - C				
1.	Examine the electrical nature of natural pacemaker with neat sketch.	**(15)**	BTL4	Analyzing	CO 5
2.	Analyze the stone disease problem and the method used to overcome with neat diagram.	**(15)**	BTL4	Analyzing	CO 5
3.	Illustrate the working of an artificial kidney with a neat diagram.	**(15)**	BTL3	Applying	CO 5
4.	Prepare the procedure of hemodialysis with suitable block diagram. Also write its merits and demerits.	**(15)**	BTL3	Applying	CO 5
5.	Explain the application of Nano robots in medical application.	**(15)**	BTL4	Analyzing	CO 5