

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

QUESTION BANK

SUBJECT : EC6001 MEDICAL ELECTRONICS

UNIT I ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING

The origin of biological systems and recording methods, typical waveforms and signal characteristics. Bio-potentials; bio-potential electrodes, amplifiers, ECG, EEG, EMG, PCG, lead

PART A

Q. No	Questions	BT Level	Competence
1.	What is PCG?	BTL 1	Remember
2.	Summarize electrode and the types of electrodes used in the bipolar measurement?	BTL 2	Understand
3.	Define ECG.	BTL 1	Remember
4.	Distinguish between resting and action potential.	BTL 2	Understand
5.	Describe the term Conduction velocity	BTL 1	Remember
6.	Point out the disadvantages of surface electrodes.	BTL 4	Analyze
7.	List out the electrodes used for recording EMG and ECG	BTL 1	Remember
8.	Show the typical ECG waveform	BTL 3	Apply
9.	Explain the term phonocardiogram	BTL 4	Analyze
10.	Assess the important bands of frequencies in EEG and their importance.	BTL 5	Evaluate
11.	Compare the signal characteristics of ECG and PCG	BTL 4	Analyze
12.	Give the EMG signal characteristics	BTL 2	Understand
13.	Rearrange the all (or) none law in respect of cell bio potential	BTL 6	Create
14.	Discuss latency as related to EMG	BTL 2	Understand
15.	Compose the Nerrest equation	BTL 6	Create

16.	Name the various lead systems used in ECG recording	BTL 1	Remember
17.	Tell about Half-cell potential.	BTL 1	Remember
18.	Justify the use of Einthoven triangle	BTL 5	Evaluate
19.	Demonstrate the various EEG signals with amplitude and frequencies.	BTL 3	Apply
20.	Illustrate the importance of biological amplifier.	BTL 3	Apply

PART – B

1.	What should be the characteristics of bio potential amplifier? Identify the origin of bio potential. (16)	BTL 1	Remember
2.	(i) Analyze the 10-20 system of recording EEG. (8) (ii) Show the typical ECG waveform and mark the important features and their associated function of the heart. (8)	BTL 4 BTL 3	Analyze Apply
3.	(i) Summarize the generation of PCG signals and discuss the measurement of PCG. (8) (ii) Give short notes on micro electrodes. (8)	BTL 2	Understand
4.	Examine the different types of bio potential electrodes used in measurement of bio signals. (16)	BTL 1	Remember
5.	(i) Compare the signal characteristics of ECG and EMG. (8) (ii) Measure the ECG recording system in detail. (8)	BTL 5	Evaluate
6.	With suitable diagram, list out the various lead systems used while recording ECG signal. (16)	BTL 1	Remember
7.	With typical waveform demonstrate the characteristics of EMG and EOG signals. (16)	BTL 3	Apply
8.	(i) Express the importance of 12 lead system in ECG. (8) (ii) Discuss about phonocardiogram (8)	BTL 2	Understand
9.	Develop the EEG waveform in detail and its signal frequency bands. (16)	BTL 6	Create
10.	Explain the action potential waveform and analyze the following terms. Resting potential, action potential, absolute refractory period and relative refractory period. (16)	BTL 4	Analyze

UNIT II BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT

pH, PO₂, PCO₂, colorimeter, Auto analyzer, Blood flow meter, cardiac output, respiratory measurement, Blood pressure, temperature, pulse, Blood Cell Counters.

PART A

Q.No	Questions	BT Level	Competence
1.	What do you understand by electrophoresis?	BTL 1	Remember
2.	Justify the meaning of pH value of blood.	BTL 5	Evaluate
3.	Give the Beer and Lamberts law.	BTL 2	Understand

4.	Define stroke volume	BTL 1	Remember
5.	Illustrate the use of auto analyser in medical field.	BTL 3	Apply
6.	Generalize the principle used in pulse rate measurement.	BTL 6	Create
7.	What is a calorimeter?	BTL 1	Remember
8.	State the disadvantages of electromagnetic blood flow meter.	BTL 2	Understand
9.	Explain auto analyser and its essential units.	BTL 4	Analyze
10.	Name any 4 physical principles based on which blood flow meters are constructed	BTL 1	Remember
11.	List the typical values of blood pressure and pulse rate of an adult.	BTL 2	Understand
12.	Calculate the stroke volume in millimetres if the cardiac output is 5.2 litres/minute and heart rate is 76 beats/minute.	BTL 3	Apply
13.	Describe the methods of measurement of cardiac output.	BTL 2	Understand
14.	Point out the components of blood.	BTL 4	Analyze
15.	Assess the use of Flame photometer.	BTL 5	Evaluate
16.	Define tidal and residual volume	BTL 1	Remember
17.	Write the demerits of indirect method of blood pressure measure measurement.	BTL 6	Create
18.	Classify the plethysmographs from plethysmography.	BTL 3	Apply
19.	How is the respiration rate measured?	BTL 1	Remember
20.	What do you infer from the term "Korotkoff sounds"?	BTL 4	Analyze

PART – B

1.	Examine the principle of following: (i) Filter Photometer (8) (ii) Auto analyser (8)	BTL 1	Remember
2.	Illustrate the following techniques with necessary diagram: (i) pCO ₂ measurement principle (8) (ii) Dye dilution (8)	BTL 3	Apply
3.	Discuss briefly about the measurement of pulse rate using various methods.	BTL 2	Understand
4.	Describe about spirometer and blood cell counter with neat block diagram.	BTL 1	Remember
5.	Explain the working principle of electromagnetic blood flow meter. What are its advantages and disadvantages?	BTL 4	Analyze
6.	Summarize how the respiratory measurement is carried out using respiratory apparatus.	BTL 2	Understand
7.	List and identify the principle of operation of blood cell counter types and its applications.	BTL 1	Remember

8.	Evaluate the measurement of cardiac output using direct and indirect methods.	BTL 5	Evaluate
9.	(i) Analyse the measurement of blood pH value. (8) (ii) Classify the temperature measurement methods. (8)	BTL 4 BTL 3	Analyze Apply
10.	Integrate the measurement of blood pressure using direct and indirect methods.	BTL 6	Create

UNIT III ASSIST DEVICES

Cardiac pacemakers, DC Defibrillator, Dialyser, Heart lung machine

PART A

Q.No	Questions	BT Level	Competence
1.	Illustrate the defibrillator output waveforms and indicate output energy level.	BTL 3	Apply
2.	State the three types of exchangers used in HEMODIALYSIS system	BTL 1	Remember
3.	Point out the typical ranges of pacemaker parameters	BTL 5	Evaluate
4.	Define tele stimulation. Give its biomedical application	BTL 1	Remember
5.	Summarize the different types of pacemakers	BTL 5	Evaluate
6.	List two important factors that demand internal pace maker's usage.	BTL 1	Remember
7.	Draw the circuit diagram of DC Defibrillator and give its output specifications	BTL 3	Apply
8.	Describe the names of the batteries used in implantable pace makers.	BTL 3	Apply
9.	What is a dialyser?	BTL 1	Remember
10.	Compare the internal and external pacemakers.	BTL 2	Understand
11.	Point out the disadvantages of DC defibrillator.	BTL 4	Analyze
12.	Tell about defibrillation	BTL 1	Remember
13.	Formulate the vital capacity of a person who has a total lung capacity of 5.95 liters, if volume of the lung of air	BTL 6	Create
14.	Give the difference between external and internal defibrillator.	BTL 2	Understand
15.	Generalize that Since the lungs contain no musculature what makes them to expand and contract in breathing	BTL 6	Create
16.	Write the meaning of fibrillation. How do you correct for it?	BTL 1	Remember

17.	Point out advantages of rectangular wave defibrillator?	BTL 4	Analyze
18.	Classify the different types of dialyser	BTL 2	Understand
19.	Summarize the classification of Pacing modes	BTL 2	Understand
20.	Identify when the demand pacemaker is used	BTL 1	Remember
PART - B			
1.	(i) What is pacemaker? What are different types of pacemaker? (8) (ii) Explain the R wave inhibited pacemaker with neat block diagram. (8)	BTL 1	Remember
2.	Summarize the functions and application of dialyzer.	BTL 2	Understand
3.	(i) Demonstrate the circuit diagram of fixed rate parameters and explain its working principle. (8) (ii) Analyze the working of synchronized dc defibrillator. (8)	BTL 3 BTL 4	Apply Analyze
4.	Generalize points about the working and types of a dialyzer?	BTL 6	Create
5.	Show the working principle of ventricular triggered pacemaker with neat diagram.	BTL 3	Apply
6.	Define what is pacemaker. Describe the different types of pacemakers.	BTL 1	Remember
7.	Discuss the following with neat diagrams. (i) R-wave inhibited pacemaker (8) (ii) R-wave triggered pacemaker. (8)	BTL 2	Understand
8.	Explain the following. (i) AC defibrillator (8) (ii) DC defibrillator (8)	BTL 4	Analyze
9.	Describe the atrial synchronous pacemaker.	BTL 1	Remember
10.	Compare the following (i) Dual peak DC defibrillator. (8) (ii) DC defibrillator with synchronizer. (8)	BTL 5	Evaluate

UNIT IV PHYSICAL MEDICINE AND BIOTELEMETRY

Diathermies- Shortwave, ultrasonic and microwave type and their applications, Surgical Diathermy Telemetry principles, frequency selection, biotelemetry, radiopill, electrical safety

PART A

Q. No	Questions	BT Level	Competence
1.	Discuss the application of Bio-Telemetry	BTL 2	Understand
2.	Recall the different elements in biotelemetry	BTL 1	Remember

3.	Point out the frequencies used for bio-telemetry.	BTL 4	Analyze
4.	State the meaning of the term radio pill.	BTL 1	Remember
5.	Distinguish between frequency division multiplex system and time division multiplex system used in transmission of bio signals.	BTL 2	Understand
6.	Name the modulation techniques used for biotelemetry. Mention the reason for adopting that modulation scheme	BTL 1	Remember
7.	Show the block diagram of a Bio-Telemetry system.	BTL 3	Apply
8.	Point out the advantages of biotelemetry system.	BTL 4	Analyze
9.	Demonstrate the two methods of shortwave diathermy	BTL 3	Apply
10.	Identify the devices used to protect against electrical hazards	BTL 1	Remember
11.	Differentiate the types of diathermy	BTL 3	Apply
12.	What do you meant by diathermy?	BTL 1	Remember
13.	Explain the safety precaution to be taken while handling radio isotopes.	BTL 4	Analyze
14.	Enumerate the principle of tele stimulation	BTL 1	Remember
15.	Compile the basic purpose of the safety measures used with electrically susceptible patients	BTL 6	Create
16.	Summarize the uses of biotelemetry.	BTL 6	Create
17.	Predict the medical transmitting frequencies. Why it is necessary to specify them?	BTL 5	Evaluate
18.	Describe various modulation techniques used for transmitting a bio signal in a telemetry system	BTL 2	Understand
19.	Classify shortwave and microwave diathermy	BTL 2	Understand
20.	Illuminate the application of diathermies	BTL 5	Evaluate

PART - B

1.	Explain single channel ECG bio telemetry system with neat diagram?	BTL 4	Analyze
2.	Describe the working and construction of radio pill with an example?	BTL 1	Remember
3.	Discuss the following with respect to electrical safety (i) Ground fault interrupter (3) (ii) Isolation transformer (3) (iii) Line Isolation monitors (3) (iv) Grounding (3)	BTL 2	Understand

	(v) Important aspects of hospital architecture (4)		
4.	Enumerate the salient features of microwave diathermy	BTL 1	Remember
5.	Illustrate the block diagram of short wave and ultrasonic diathermy and explain.	BTL 3	Apply
6.	Compare and explain the telemetry circuit diagram for the transmission of EMG, ECG, EEG and respiration rate?	BTL 5	Evaluate
7.	Discuss the basic concepts (including the modulation types) of radio transmission used in bio telemetry.	BTL 2	Understand
8.	Generalize the problems associated with the implant telemetry circuits? Explain the subcarrier biotelemetry?	BTL 6	Create
9.	(i) Describe the surgical diathermy? (8) (ii) Write short notes on frequency selection with respect to biotelemetry? (8)	BTL 1	Remember
10.	Elaborate the multiple channel telemetry systems with neat diagrams.	BTL 4	Analyze

UNIT V RECENT TRENDS IN MEDICAL INSTRUMENTATION

Thermograph, endoscopy unit, Laser in medicine, cryogenic application, Introduction to telemedicine.

PART A

Q. No	Questions	BT Level	Competence
1.	Define Thermograph.	BTL 1	Remember
2.	Analyse the principle of cryogenic technique and list its applications	BTL 4	Analyze
3.	Give the advantages of cryogenic surgery.	BTL 2	Understand
4.	State the properties of LASER.	BTL 1	Remember
5.	Demonstrate the types of lasers used in medical field.	BTL 3	Apply
6.	List the parts of endoscope unit.	BTL 1	Remember
7.	Summarize the necessary parameters for a good thermographic equipment.	BTL 2	Understand
8.	Identify the diseases that can be diagnosed by thermography.	BTL 1	Remember
9.	Point out the advantages of LASER in surgery.	BTL 4	Analyze
10.	Describe any one of the therapeutic instrument using an endoscope.	BTL 2	Understand
11.	Illustrate the uses of endoscope in medicine.	BTL 3	Apply
12.	Name the three types of thermography.	BTL 1	Remember

13.	Explain an endoscope	BTL 5	Evaluate
14.	Write the types of lasers used for surgery	BTL 6	Create
15.	Discuss the applications of thermography.	BTL 2	Understand
16.	Tabulate the merits and demerits of various medical thermographic techniques.	BTL 1	Remember
17.	Show the simplified block diagram of thermographic equipment.	BTL 3	Apply
18.	Recommend the potential benefits of telemedicine.	BTL 5	Evaluate
19.	Prepare the guidelines for the use of telemedicine.	BTL 6	Create
20.	Infer the term "Telemedicine"	BTL 4	Analyze
PART - B			
1.	Explain the different types of Lasers used in medicine.	BTL 4	Analyze
2.	Draw the basic setup of a medical thermograph unit and define the function of each unit in it. Name the applications of thermograph.	BTL 1	Remember
3.	(i) Justify the need for each of the essential components in an endoscope & its applications. (8) (ii) Summarize a note on cryogenic surgery. (8)	BTL 5	Evaluate
4.	A bloodless surgery is being planned using laser. Invent which type of laser is suitable to achieve this. Discuss on the process involve in the laser production and application.	BTL 6	Create
5.	(i) Examine briefly about endoscopy. (8) (ii) Illustrate the principle of infrared thermographic instrumentation with block diagram. (8)	BTL 3	Apply
6.	Describe about the evolution and technologies involved in telemedicine. Discuss the application areas of telemedicine.	BTL 2	Understand
7.	(i) What are the uses of endoscopes in medicine? Describe any one of the therapeutic instrument using an endoscope. (8) (ii) Explain with block diagram the infrared thermograph technique and its merits and demerits. (8)	BTL 1 BTL 4	Remember Analyze
8.	(i) What are the medical applications of thermography? (8) (ii) Give an account on biological effects of radiation exposure & safe dose equivalent limits. (8)	BTL 1 BTL 2	Remember Understand
9.	(i) Define the laser principle and identify the different laser interactions on our body. (8) (ii) Write short notes on He-Ne laser and the general applications of laser in medicine (8)	BTL 1	Remember
10.	(i) Give a brief detail note about Endoscopy unit. (8) (ii) Demonstrate the salient features of Bio Medical Laser instrumentation. (8)	BTL 2 BTL 3	Understand Apply