CENTRAL POLYTECHNIC COLLEGE

THARAMANI, CHENNAI – 600 113

(AN AUTONOMOUS INSTITUTION)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

QUESTION BANK

FOR

EEC51032 – MEDICAL INSTRUMENTATION

UNIT	Q NO	QUESTIONS
1	1	What is the typical range of resting potential in excitable cells? (a) -20 to -40 mV (b) -60 to -100 mV (c) +10 to +30 mV (d) 0 mV **Ans:-60 to -100 mV**
1	2	Which ion primarily moves inside the cell during depolarization? (a) Sodium (Na^+) (b) Potassium (K^+) (c) Chloride (Cl^-) (d) Calcium (Ca^{2+}) **Ans:Sodium (Na^+)**
1	3	The return of cell potential back to resting state is called: (a) Polarization (b) Depolarization (c) Repolarization (d) Excitation **Ans:Repolarization**
1	4	The process of changing resting potential to action potential is called: (a) Polarization (b) Repolarization (c) Depolarization (d) Excitation block **Ans:Depolarization**
1	5	A cell in the resting state is said to be: (a) Depolarized (b) Polarized (c) Repolarized (d) Excited **Ans:Polarized**
1	6	Typical action potential amplitude is about: (a) +20 mV (b) +100 mV (c) -90 mV (d) 0 mV **Ans:+20 mV**
1	7	Potassium ions during depolarization: (a) Enter the cell (b) Leave the cell (c) Stay constant (d) Get blocked **Ans:Leave the cell**
1	8	The CNS consists of: (a) Brain only (b) Spinal cord only (c) Brain and spinal cord (d) Peripheral nerves **Ans:Brain and spinal cord**
1	9	Which lobe of the brain stores visual memories? (a) Temporal (b) Parietal (c) Frontal (d) Occipital **Ans:Occipital lobe**
1	10	Which part of brain regulates balance and coordination? (a) Cerebrum (b) Cerebellum (c) Brainstem (d) Thalamus **Ans:Cerebellum**

UNIT	Q NO	QUESTIONS
1	11	The hypothalamus controls: (a) Emotions & metabolism (b) Muscle contraction (c) Reflex action (d) Speech **Ans:Emotions & metabolism**
1	12	Which part of CNS acts as relay station for sensory pathways? (a) Pons (b) Medulla (c) Thalamus (d) Cerebellum **Ans:Thalamus**
1	13	Which lobe of cerebrum is responsible for intelligence and thought? (a) Temporal (b) Frontal (c) Parietal (d) Occipital **Ans:Frontal**
1	14	Medulla oblongata regulates: (a) Digestion (b) Breathing & heart rate (c) Vision (d) Reflexes **Ans:Breathing & heart rate**
1	15	Which part of brain regulates sleep-wake cycle? (a) Midbrain (b) Pons (c) Cerebellum (d) Cerebrum **Ans:Pons**
1	16	Spinal cord connects: (a) Brain to muscles (b) Brain to peripheral nervous system (c) Brain to circulatory system (d) Brain to lungs **Ans:Brain to peripheral nervous system**
1	17	Which blood vessels are the site of exchange of oxygen and nutrients? (a) Arteries (b) Veins (c) Capillaries (d) Aorta **Ans:Capillaries**
1	18	Pulmonary circulation carries blood from: (a) Left ventricle → body (b) Right ventricle → lungs (c) Left atrium → lungs (d) Right atrium → body **Ans:Right ventricle → lungs**
1	19	Which heart chamber pumps oxygenated blood to body? (a) Right atrium (b) Right ventricle (c) Left atrium (d) Left ventricle **Ans:Left ventricle**
1	20	Which valve prevents backflow from left ventricle to left atrium? (a) Pulmonary valve (b) Tricuspid valve (c) Mitral valve (d) Aortic valve **Ans:Mitral valve**

UNIT	Q NO	QUESTIONS
1	21	Outer layer of heart wall is called: (a) Myocardium (b) Endocardium (c) Pericardium (d) Epicardium only **Ans:Pericardium**
1	22	Which vessels return deoxygenated blood to heart? (a) Arteries (b) Capillaries (c) Veins (d) Aorta **Ans:Veins**
1	23	Pulmonary veins carry: (a) Deoxygenated blood to lungs (b) Oxygenated blood to left atrium (c) Mixed blood to right atrium (d) Carbon dioxide to lungs **Ans:Oxygenated blood to left atrium**
1	24	Systemic circulation begins from: (a) Right atrium (b) Left atrium (c) Right ventricle (d) Left ventricle **Ans:Left ventricle**
1	25	Which circulation oxygenates blood? (a) Systemic (b) Pulmonary (c) Coronary (d) Hepatic **Ans:Pulmonary**
1	26	Which organ stores urine until excretion? (a) Kidney (b) Bladder (c) Ureter (d) Urethra **Ans:Bladder**
1	27	The diaphragm helps in: (a) Digestion (b) Breathing (c) Circulation (d) Urination **Ans:Breathing**
1	28	Gas exchange occurs in: (a) Bronchi (b) Trachea (c) Alveoli (d) Pharynx **Ans:Alveoli**
1	29	Expiration expels mainly: (a) Oxygen (b) Nitrogen (c) Carbon dioxide (d) Water vapor **Ans:Carbon dioxide**
1	30	Which organ stores urine? (a) Ureter (b) Kidney (c) Bladder (d) Urethra **Ans:Bladder**

UNIT	Q NO	QUESTIONS
1	31	Tubes carrying urine from kidney to bladder are: (a) Urethra (b) Ureters (c) Capillaries (d) Arterioles **Ans:Ureters**
1	32	Which structure filters blood to form urine? (a) Ureter (b) Kidney (c) Bladder (d) Urethra **Ans:Kidney**
1	33	Which electrode type is used for recording from a single cell? (a) Skin surface electrode (b) Needle electrode (c) Microelectrode (d) Metal plate electrode **Ans:Microelectrode**
1	34	Which biomedical amplifier provides both high gain and high input impedance? (a) Differential amplifier (b) Operational amplifier (c) Instrumentation amplifier (d) Chopper amplifier **Ans:Instrumentation amplifier**
1	35	Which electrode type uses a tiny glass pipette? (a) Micropipette microelectrode (b) Metal microelectrode (c) Skin surface electrode (d) Disposable electrode **Ans:Micropipette microelectrode**
1	36	Suction cup electrodes are mainly used for: (a) EEG (b) Unipolar chest leads (c) Limb leads (d) EMG **Ans:Unipolar chest leads**
1	37	Which electrode eliminates movement artifact using electrolyte bridge? (a) Adhesive electrode (b) Floating electrode (c) Suction electrode (d) Needle electrode **Ans:Floating electrode**
1	38	Multipoint electrode can be used without shaving hair because: (a) Large surface area (b) Many fine contact points (c) Needle penetration (d) Magnetic contacts **Ans:Many fine contact points**
1	39	Which electrode is used as EEG reference? (a) Limb electrode (b) Ear clip electrode (c) Needle electrode (d) Disposable electrode **Ans:Ear clip electrode**
1	40	Longer needle electrodes are used to record: (a) EMG potentials (b) Action potentials in brain (c) Skin surface signals (d) ECG potentials **Ans:Brain potentials**

UNIT	Q NO	QUESTIONS
1	41	Electroneurography uses: (a) Skin electrodes (b) Needle electrodes (c) Microelectrodes (d) Floating electrodes **Ans:Needle electrodes**
1	42	A unipolar hypodermic needle contains: (a) Two wires (b) Single wire (c) Three wires (d) No wire **Ans:Single wire**
1	43	Disposable electrodes advantage is: (a) Reusable (b) No cleaning required (c) High impedance (d) Penetrates tissue **Ans:No cleaning**
1	44	EMG signals are measured by: (a) Microelectrode (b) Needle electrode (c) Limb electrode (d) Adhesive electrode **Ans:Needle electrode**
1	45	Which sensor measures emotional arousal via sweat gland activity? (a) EMG sensor (b) GSR sensor (c) Pulse sensor (d) Temperature sensor **Ans:GSR sensor**
1	46	Which biomedical sensor measures heart rate? (a) Pulse sensor (b) Temperature sensor (c) EMG sensor (d) GSR sensor **Ans:Pulse sensor**
1	47	Which sensor measures muscle activity? (a) EEG sensor (b) EMG sensor (c) Pulse sensor (d) GSR sensor **Ans:EMG sensor**
1	48	Which type of transducer requires external excitation? (a) Active (b) Passive (c) Photovoltaic (d) Piezoelectric **Ans:Passive**
1	49	Example of an active transducer: (a) Strain gauge (b) Photovoltaic cell (c) Thermistor (d) LVDT **Ans:Photovoltaic cell**
1	50	Which amplifier rejects common signals and amplifies difference? (a) Instrumentation amplifier (b) Differential amplifier (c) Chopper amplifier (d) Isolation amplifier **Ans:Differential amplifier**

UNIT	Q NO	QUESTIONS
2	1	What does the P wave in an ECG represent? (a) Atrial depolarisation (b) Ventricular depolarisation (c) Atrial repolarisation (d) Ventricular repolarisation **Ans:Atrial depolarisation**
2	2	Normal amplitude of P wave in ECG is (a) 0.10 mV (b) 0.25 mV (c) 1.60 mV (d) 0.50 mV **Ans:0.25 mV**
2	3	Which interval represents ventricular contraction? (a) PR interval (b) ST interval (c) TU interval (d) QT interval **Ans:ST interval**
2	4	Which lead connects LA and RA? (a) Lead I (b) Lead II (c) Lead III (d) Chest Lead V1 **Ans:Lead I**
2	5	If PR interval > 0.22 sec, it indicates (a) Bundle block (b) Ventricular fibrillation (c) First degree AV block (d) Coronary insufficiency **Ans:First degree AV block**
2	6	Which component represents ventricular depolarisation? (a) P wave (b) QRS complex (c) T wave (d) U wave **Ans:QRS complex**
2	7	Duration of normal QRS complex is (a) 0.07–0.1 sec (b) 0.12–0.22 sec (c) 0.05–0.15 sec (d) 0.2 sec **Ans:0.07–0.1 sec**
2	8	Which block occurs when QRS > 0.1 sec? (a) AV block (b) Bundle block (c) Myocardial infarction (d) Coronary insufficiency **Ans:Bundle block**
2	9	In Einthoven's triangle, Lead II is between (a) LA & RA (b) LL & RA (c) LL & LA (d) RA & Chest **Ans:LL & RA**
2	10	Which amplifier provides high CMRR in ECG recorder? (a) Power amplifier (b) Preamplifier (c) Auxiliary amplifier (d) Pen amplifier **Ans:Preamplifier**

UNIT	Q NO	QUESTIONS
2	11	Which wave indicates ventricular repolarisation? (a) P wave (b) QRS complex (c) T wave (d) U wave **Ans:T wave**
2	12	ST elevation in ECG indicates (a) AV block (b) Myocardial infarction (c) Ventricular fibrillation (d) Hypertension **Ans:Myocardial infarction**
2	13	Right leg electrode in ECG is connected to (a) Ground (b) Auxiliary amplifier output (c) Preamplifier input (d) Buffer amplifier **Ans:Auxiliary amplifier output**
2	14	The device used to protect from overvoltage during surgery in ECG is (a) Buffer amplifier (b) Lead selector (c) Overvoltage protection circuit (d) Pen amplifier **Ans:Overvoltage protection circuit**
2	15	The calibration voltage in ECG recorder is (a) 0.25 mV (b) 1 mV (c) 5 mV (d) 10 mV **Ans:1 mV**
2	16	The auxiliary amplifier mainly increases (a) Sensitivity (b) Noise (c) CMRR (d) Gain **Ans:CMRR**
2	17	Which abnormal ECG shows train of pulses instead of PQRST? (a) AV block (b) Ventricular fibrillation (c) Coronary insufficiency (d) Myocardial infarction **Ans:Ventricular fibrillation**
2	18	Which part of ECG machine drives the pen motor? (a) Preamplifier (b) Power amplifier (c) Buffer amplifier (d) Oscilloscope **Ans:Power amplifier**
2	19	Which electrode arrangement forms Wilson central terminal? (a) RA, LA, LL with resistors (b) RA, LA, RL with resistors (c) Chest electrodes only (d) LL, RL only **Ans:RA, LA, LL with resistors**
2	20	The ECG output unit may be (a) LED (b) Printer (c) CRO/paper chart recorder (d) LCD **Ans:CRO/paper chart recorder**

UNIT	Q NO	QUESTIONS	
2	21	Which test records electrical activity of brain?	
		(a) ECG	(b) EEG
		(c) EMG	(d) ERG
		Ans:EEG	
2	22	EEG electrode placement system is	
		(a) 10-10 system	(b) 10-20 system
		(c) 20-20 system	(d) Random
		Ans:10-20 system	
2	23	Frequency of alpha waves is	
		(a) 0.5–4 Hz	(b) 4–8 Hz
		(c) 8–13 Hz	(d) 13–30 Hz
		Ans:8–13 Hz	
2	24	Delta waves occur during	
		(a) Awake state	(b) Deep sleep
		(c) Tension	(d) Intense activity
		Ans:Deep sleep	
2	25	Beta waves are dominant during	
		(a) Relaxed awake	(b) Deep sleep
		(c) Tension	(d) Brain death
		Ans:Tension	
2	26	Which amplifier reduces 50 Hz interference in EEG?	
		(a) Power amplifier	(b) Preamplifier
		(c) Audio amplifier	(d) Buffer
		Ans:Preamplifier	
2	27	Number of electrodes in EEG patient cable	
		(a) 12	(b) 18
		(c) 21	(d) 30
		Ans:21	
2	28	EEG is useful for diagnosis of	
		(a) Heart attack	(b) Epilepsy
		(c) Muscle fatigue	(d) Hypertension
		Ans:Epilepsy	
2	29	Gamma waves occur at frequencies	
		(a) 4–8 Hz	(b) 8–13 Hz
		(c) >22 Hz	(d) 13–30 Hz
		Ans:>22 Hz	
2	30	Midpoint of nasion-inion line is called	
		(a) Oz	(b) Cz
		(c) Fp	(d) Pz
		Ans:Cz	

UNIT	Q NO	QUESTIONS
2	31	Which test records electrical activity of muscles? (a) ECG (b) EEG (c) EMG (d) ERG **Ans:EMG**
2	32	Normal EMG peak amplitude range is (a) 1–5 µV (b) 50 µV – 1 mV (c) 5–10 mV (d) >10 mV **Ans:50 µV – 1 mV**
2	33	EMG frequency response is (a) 0.5–4 Hz (b) 10–3000 Hz (c) 8–13 Hz (d) 20–20000 Hz **Ans:10–3000 Hz**
2	34	Which electrode records from single muscle fiber? (a) Surface (b) Needle (c) Chest (d) Limb **Ans:Needle**
2	35	Which instrument displays EMG? (a) CRO (b) ECG recorder (c) EEG recorder (d) Pulse oximeter **Ans:CRO**
2	36	Amplifier used in EMG is (a) Buffer (b) Instrumentation amplifier (c) Audio amplifier (d) Power amplifier **Ans:Instrumentation amplifier**
2	37	Myographer listens to EMG using (a) CRO (b) Tape recorder (c) Loudspeaker (d) Headphones **Ans:Loudspeaker**
2	38	EMG signal recording can be stored using (a) Printer (b) Tape recorder (c) Microphone (d) Calibrator **Ans:Tape recorder**
2	39	What does absence of EMG signal indicate? (a) Relaxed muscle (b) Contracted muscle (c) Fatigue (d) Noise **Ans:Relaxed muscle**
2	40	Electrode paste in EMG is used to (a) Reduce impedance (b) Increase impedance (c) Increase gain (d) Record more fibers **Ans:Reduce impedance**

UNIT	Q NO	QUESTIONS
2	41	SpO_2 normal range in humans is (a) 70–80% (b) 80–90% (c) 95–100% (d) >100% **Ans:95–100%**
2	42	Which wavelengths are used in pulse oximetry? (a) 500 & 600 nm (b) 660 & 940 nm (c) 700 & 1200 nm (d) 300 & 400 nm **Ans:660 & 940 nm**
2	43	Which component detects transmitted light in oximeter? (a) LED (b) Photodiode (c) Phototransistor (d) Resistor **Ans:Photodiode**
2	44	Which type of oximetry is performed outside the body? (a) Vivo (b) Vitro (c) Clinical (d) Dynamic **Ans:Vitro**
2	45	Pulse oximeter also measures (a) ECG (b) EMG (c) Pulse rate (d) EEG **Ans:Pulse rate**
2	46	Normal systolic blood pressure is (a) 80 mmHg (b) 100 mmHg (c) 120 mmHg (d) 140 mmHg **Ans:120 mmHg**
2	47	The instrument used for indirect BP measurement is (a) ECG (b) Sphygmomanometer (c) Oximeter (d) Audiometer **Ans:Sphygmomanometer**
2	48	The Korotkoff sounds are heard using (a) Microphone (b) CRO (c) Stethoscope (d) Loudspeaker **Ans:Stethoscope**
2	49	Pulse pressure is calculated as (a) SP+DP (b) SP–DP (c) SP×DP (d) SP/DP **Ans:SP–DP**
2	50	Which diagnostic test measures electrical activity of retina? (a) EEG (b) ECG (c) ERG (d) EMG **Ans:ERG**

UNIT	Q NO	QUESTIONS
3	1	Shortwave diathermy uses which frequency range? (a) 10–30 MHz (b) 27.12 MHz (c) 2.45 GHz (d) 100 kHz **Ans:27.12 MHz**
3	2	Primary therapeutic effect of ultrasound therapy is: (a) Muscle stimulation (b) Deep heating (c) Electrical stimulation (d) Bone strengthening **Ans:Deep heating**
3	3	The main coupling medium for ultrasound therapy is: (a) Alcohol (b) Water (c) Gel (d) Oil **Ans:Gel**
3	4	Shortwave diathermy electrodes are placed: (a) Directly on skin (b) With towel spacing (c) Immersed in water (d) Inside ear **Ans:With towel spacing**
3	5	Ultrasound therapy frequency for deep tissues is usually: (a) 0.5 MHz (b) 1 MHz (c) 3 MHz (d) 5 MHz **Ans:1 MHz**
3	6	Shortwave diathermy is contraindicated in patients with: (a) Hypertension (b) Pacemakers (c) Obesity (d) Fever **Ans:Pacemakers**
3	7	The mode of ultrasound used for acute inflammation is: (a) Continuous (b) Pulsed (c) Direct current (d) Interferential **Ans:Pulsed**
3	8	The specific absorption rate in SWD depends on: (a) Wavelength (b) Tissue conductivity (c) Blood group (d) Heart rate **Ans:Tissue conductivity**
3	9	Ultrasound head movement during therapy prevents: (a) Cavitation (b) Overheating of tissue (c) Wave reflection (d) Nerve stimulation **Ans:Overheating of tissue**
3	10	SWD primarily produces heat by: (a) Ionization (b) Eddy currents (c) Photons (d) Mechanical vibration **Ans:Eddy currents**

UNIT	Q NO	QUESTIONS
3	11	The main function of a pacemaker is to: (a) Increase blood oxygen levels (b) Stimulate heart muscles (c) Reduce blood sugar (d) Filter toxins **Ans:Stimulate heart muscles**
3	12	Which part of a pacemaker carries pulses from the generator to the heart? (a) Lead (b) Sensor (c) Battery (d) Amplifier **Ans:Lead**
3	13	In a fixed-rate pacemaker, the pacing rate is: (a) Variable with patient rhythm (b) Pre-set at a fixed value (c) Random (d) Controlled by patient movement **Ans:Pre-set at a fixed value**
3	14	Which type of pacemaker avoids competition between natural and artificial pacing? (a) Fixed-rate (b) Demand (c) Asynchronous (d) External **Ans:Demand**
3	15	The sensing circuit in a pacemaker detects: (a) ECG signals (b) Oxygen saturation (c) Blood pressure (d) Respiratory rate **Ans:ECG signals**
3	16	Typical voltage of constant-voltage pacemaker pulses is: (a) 1 V (b) 3 V (c) 5 V (d) 10 V **Ans:5 V**
3	17	The output current range for constant-current pacemaker pulses is typically: (a) 1–2 mA (b) 3–5 mA (c) 8–10 mA (d) 15–20 mA **Ans:8–10 mA**
3	18	The refractory period in pacemakers prevents: (a) High temperature (b) Over-sensing (c) Muscle cramps (d) Low oxygen **Ans:Over-sensing**
3	19	In an ICD, if fibrillation is detected, the capacitor charges to approximately: (a) 250 V (b) 500 V (c) 750 V (d) 1000 V **Ans:750 V**
3	20	Energy delivered by ICD during defibrillation is approximately: (a) 5–10 J (b) 15–20 J (c) 30–35 J (d) 50–60 J **Ans:30–35 J**

UNIT	Q NO	QUESTIONS
3	21	The main function of dialysis is to: (a) Pump blood (b) Remove waste products (c) Increase oxygen level (d) Reduce heart rate **Ans:Remove waste products**
3	22	Hemodialysis uses which type of membrane? (a) Semipermeable (b) Impermeable (c) Porous (d) Metallic **Ans:Semipermeable**
3	23	The dialysate solution composition is designed to: (a) Match plasma electrolyte levels (b) Lower blood pressure (c) Increase heart rate (d) Kill bacteria **Ans:Match plasma electrolyte levels**
3	24	Peritoneal dialysis uses which membrane? (a) Dialyzer (b) Artificial membrane (c) Peritoneum (d) Plastic film **Ans:Peritoneum**
3	25	Blood flow rate in hemodialysis is typically: (a) 50–100 mL/min (b) 200–500 mL/min (c) 600–800 mL/min (d) >1000 mL/min **Ans:200–500 mL/min**
3	26	Which toxin is most rapidly removed in dialysis? (a) Urea (b) Creatinine (c) Bilirubin (d) Glucose **Ans:Urea**
3	27	Dialysis fluid is usually warmed to: (a) 20°C (b) 25°C (c) 37°C (d) 40°C **Ans:37°C**
3	28	Heparin in dialysis is used to: (a) Kill bacteria (b) Prevent clotting (c) Improve diffusion (d) Increase pH **Ans:Prevent clotting**
3	29	Continuous Ambulatory Peritoneal Dialysis (CAPD) is performed: (a) In hospital only (b) By machine at night (c) Manually throughout the day (d) Only in emergencies **Ans:Manually throughout the day**
3	30	Main advantage of peritoneal dialysis over hemodialysis is: (a) Faster clearance (b) Less dietary restriction (c) Less equipment dependency (d) More protein removal **Ans:Less equipment dependency**

UNIT	Q NO	QUESTIONS	
3	31	The main function of a ventilator is to:	
		(a) Circulate blood	(b) Deliver oxygen and remove CO_2
		(c) Measure lung volume	(d) Humidify air
		Ans:Deliver oxygen and remove CO_2	
3	32	Positive Pressure Ventilation delivers air:	
		(a) By suction	(b) By pushing into lungs
		(c) By gravity	(d) By osmosis
		Ans:By pushing into lungs	
3	33	In volume-controlled ventilation, the parameter set is:	
		(a) Pressure	(b) Volume
		(c) Flow	(d) Oxygen concentration
		Ans:Volume	
3	34	PEEP in ventilators stands for:	
		(a) Positive End-Expiratory Pressure	(b) Pulmonary Expiration Pressure
		(c) Partial End Pressure	(d) Patient Expiration End Pressure
		Ans:Positive End-Expiratory Pressure	
3	35	High PEEP can cause:	
		(a) Increased venous return	(b) Decreased cardiac output
		(c) Hyperthermia	(d) Hypoglycemia
		Ans:Decreased cardiac output	
3	36	The trigger sensitivity in ventilators controls:	
		(a) When inspiration starts	(b) Air humidity
		(c) Oxygen percentage	(d) Pressure limit
		Ans:When inspiration starts	
3	37	CPAP stands for:	
		(a) Continuous Positive Airway Pressure	(b) Controlled Pulmonary Air Pressure
		(c) Constant Pulmonary Airway Pressure	(d) Continuous Pulmonary Arterial Pressure
		Ans:Continuous Positive Airway Pressure	
3	38	The FiO_2 setting in a ventilator determines:	
		(a) Pressure limit	(b) Oxygen concentration
		(c) Tidal volume	(d) Flow rate
		Ans:Oxygen concentration	
3	39	Pressure support ventilation helps to:	
		(a) Reduce patient effort	(b) Increase CO_2
		(c) Reduce oxygenation	(d) Lower PEEP
		Ans:Reduce patient effort	
3	40	Inverse ratio ventilation increases:	
		(a) Inspiration time	(b) Expiration time
		(c) Flow rate	(d) Tidal volume
		Ans:Inspiration time	

UNIT	Q NO	QUESTIONS
3	41	The heart–lung machine is used during: (a) Appendectomy (b) Open-heart surgery (c) Dialysis (d) Ventilation **Ans:Open-heart surgery**
3	42	Oxygenator in heart–lung machine replaces the function of: (a) Heart (b) Kidney (c) Lungs (d) Liver **Ans:Lungs**
3	43	The pump in heart–lung machine replaces the function of: (a) Lungs (b) Heart (c) Kidneys (d) Liver **Ans:Heart**
3	44	The main anticoagulant used in heart–lung bypass is: (a) Warfarin (b) Heparin (c) Aspirin (d) Clopidogrel **Ans:Heparin**
3	45	The reservoir in a heart–lung machine stores: (a) Blood (b) Oxygen (c) Dialysate (d) Carbon dioxide **Ans:Blood**
3	46	Cardioplegia solution is used to: (a) Start heart (b) Stop heart (c) Increase heart rate (d) Reduce blood clotting **Ans:Stop heart**
3	47	During bypass, temperature is often: (a) Increased (b) Decreased (c) Kept constant (d) Alternated **Ans:Decreased**
3	48	Gas exchange in the oxygenator occurs by: (a) Diffusion (b) Osmosis (c) Filtration (d) Active transport **Ans:Diffusion**
3	49	Bubble oxygenators have largely been replaced by: (a) Membrane oxygenators (b) Rotary pumps (c) Dialyzers (d) Ventilators **Ans:Membrane oxygenators**
3	50	The main risk during heart–lung bypass is: (a) Hyperglycemia (b) Air embolism (c) Hypoglycemia (d) Fever **Ans:Air embolism**

UNIT	Q NO	QUESTIONS
4	1	The principle used in ultrasonic transducers is (a) Piezoelectric effect (b) Photoelectric effect (c) Doppler effect (d) Hall effect **Ans:Piezoelectric effect**
4	2	3D ultrasound images are constructed by (a) Using Doppler shifts (b) Scanning cross-sections at many angles (c) Rotating X-ray tube (d) Using MRI coils **Ans:Scanning cross-sections at many angles**
4	3	In axial echo cardiography, the PLAX view shows (a) Left ventricle and right atrium only (b) LV, RV, Ao, LA (c) Only aorta (d) Pulmonary valve **Ans:LV, RV, Ao, LA**
4	4	The Doppler ultrasound mode is mainly used to (a) View organ movement (b) Measure blood flow (c) Detect bone fractures (d) Produce 3D images **Ans:Measure blood flow**
4	5	Which ultrasound type adds time as the fourth dimension? (a) 2D (b) 3D (c) 4D (d) Doppler **Ans:4D**
4	6	The apical four-chamber view shows (a) Both ventricles and atria (b) Only LV and LA (c) Only RV and RA (d) Coronary arteries **Ans:Both ventricles and atria**
4	7	In parasternal short axis at papillary muscle level, we can see (a) Mitral valve (b) Pulmonary artery (c) LV and RV (d) Only LV **Ans:LV and RV**
4	8	Ultrasound imaging is preferred over X-ray for soft tissues because (a) Higher radiation dose (b) Ionizing radiation (c) Clear soft tissue images without radiation (d) Lower resolution **Ans:Clear soft tissue images without radiation**
4	9	Which imaging mode provides 1D view similar to a tracing? (a) 2D (b) 3D (c) M-mode (d) Doppler **Ans:M-mode**
4	10	The main advantage of ultrasound over MRI is (a) Higher contrast (b) Lower cost and portability (c) More detailed brain images (d) No gel required **Ans:Lower cost and portability**

UNIT	Q NO	QUESTIONS
4	11	The high voltage transformer in an X-ray machine produces (a) 2–5 kV (b) 20–200 kV (c) 500–1000 V (d) 1–5 MV **Ans:20–200 kV**
4	12	The aluminium filter in X-ray machines removes (a) High frequency X-rays (b) Soft X-rays (c) All X-rays (d) Visible light **Ans:Soft X-rays**
4	13	The collimator's role in X-ray imaging is to (a) Produce X-rays (b) Focus the image (c) Reduce patient dose and align beam (d) Rotate the anode **Ans:Reduce patient dose and align beam**
4	14	In tomography, unwanted image planes are removed by (a) Increasing exposure (b) Intentional motion unsharpness (c) Higher frequency (d) Larger detector **Ans:Intentional motion unsharpness**
4	15	In CT, a 3D image is built from (a) Single X-ray (b) Multiple slices (c) One projection (d) MRI scan **Ans:Multiple slices**
4	16	Which part in CT rotates around the gantry? (a) Detector (b) X-ray tube (c) Patient bed (d) Lead shield **Ans:X-ray tube**
4	17	PET scanning uses which radiation? (a) Infrared (b) Gamma rays (c) UV rays (d) Microwave **Ans:Gamma rays**
4	18	The radioactive substance used in PET is called (a) Radiotracer (b) Radiofilter (c) Radiodetector (d) Radioamplifier **Ans:Radiotracer**
4	19	In PET, two gamma rays travel (a) In the same direction (b) At right angles (c) Almost opposite directions (d) Randomly **Ans:Almost opposite directions**
4	20	A VGA in PET electronics is used to (a) Filter noise (b) Compensate PMT sensitivity variations (c) Produce RF pulses (d) Create magnetic fields **Ans:Compensate PMT sensitivity variations**

UNIT	Q NO	QUESTIONS
4	21	Infrared thermography detects (a) Visible light (b) Temperature variations (c) X-ray density (d) Magnetic fields **Ans:Temperature variations**
4	22	The human body emits infrared radiation proportional to (a) Blood flow (b) Surface temperature (c) Heart rate (d) Oxygen level **Ans:Surface temperature**
4	23	The chopper disc in IR thermography is used to (a) Focus radiation (b) Interrupt IR beam for AC signals (c) Cool the detector (d) Align the mirror **Ans:Interrupt IR beam for AC signals**
4	24	An infrared camera converts heat patterns into (a) X-rays (b) Thermograms (c) Magnetic maps (d) CT slices **Ans:Thermograms**
4	25	One use of IR thermography is (a) Detecting fractures (b) Breast cancer detection (c) Blood clot detection (d) Measuring brain waves **Ans:Breast cancer detection**
4	26	MRI stands for (a) Magnetic Radiation Imaging (b) Magnetic Resonance Imaging (c) Magnetic Response Investigation (d) Molecular Resonance Imaging **Ans:Magnetic Resonance Imaging**
4	27	The main advantage of MRI over CT is (a) Faster scanning (b) No ionizing radiation (c) Lower cost (d) Uses X-rays **Ans:No ionizing radiation**
4	28	Gradient coils in MRI are used to (a) Produce main magnetic field (b) Produce spatially varying fields (c) Generate RF pulses (d) Detect IR radiation **Ans:Produce spatially varying fields**
4	29	MRI images are reconstructed using (a) Fourier transform (b) Laplace transform (c) Radon transform (d) Hilbert transform **Ans:Fourier transform**
4	30	Which property of protons is used in MRI? (a) Electric charge (b) Magnetic moment (c) Mass (d) Temperature **Ans:Magnetic moment**

UNIT	Q NO	QUESTIONS	
4	31	LASER stands for	
		(a) Light Amplification by Stimulated Emission of Radiation	(b) Light Absorption by Spontaneous Emission of Rays
		(c) Laser Assisted Surgical Energy Radiation	(d) Light Amplification by Simultaneous Energy Release
		Ans:Light Amplification by Stimulated Emission of Radiation	
4	32	Endoscopy uses	
		(a) X-rays	(b) Lenses or optical fibres
		(c) Magnetic coils	(d) Ultrasound
		Ans:Lenses or optical fibres	
4	33	Argon ion lasers are useful in	
		(a) Photocoagulation	(b) MRI scanning
		(c) X-ray generation	(d) CT imaging
		Ans:Photocoagulation	
4	34	Diameter of quartz fibre in laser endoscope is about	
		(a) 2 mm	(b) 5 mm
		(c) 10 mm	(d) 0.5 mm
		Ans:2 mm	
4	35	Laser photocoagulation of retina avoids	
		(a) Damaging surrounding tissue	(b) Tumour growth
		(c) Blood clots	(d) Infections
		Ans:Damaging surrounding tissue	
4	36	The ultrasound gel is used to	
		(a) Increase temperature	(b) Block sound
		(c) Facilitate transmission of sound waves	(d) Protect probe
		Ans:Facilitate transmission of sound waves	
4	37	Echo cardiography shows	
		(a) Only structure	(b) Only movement
		(c) Structure and movement	(d) Only blood flow
		Ans:Structure and movement	
4	38	In X-ray imaging, bucky grid improves	
		(a) Contrast by removing scatter	(b) Speed of exposure
		(c) Colour of image	(d) Magnetic field strength
		Ans:Contrast by removing scatter	
4	39	CT scan images can be reformatted in	
		(a) Single plane only	(b) Multiple planes
		(c) Only sagittal plane	(d) Only coronal plane
		Ans:Multiple planes	
4	40	Infrared imaging wavelength range is	
		(a) 0.77 to 100 μm	(b) 100–500 nm
		(c) 1–10 mm	(d) 400–700 nm
		Ans:0.77 to 100 μm	

UNIT	Q NO	QUESTIONS	
4	41	MRI slice orientation options include	
		(a) Sagittal, coronal, oblique	(b) Only axial
		(c) Horizontal, vertical	(d) Cross-section only
		Ans:Sagittal, coronal, oblique	
4	42	In gastric haemorrhage control, which is used?	
		(a) MRI	(b) CT
		(c) Argon ion laser endoscope	(d) Infrared camera
		Ans:Argon ion laser endoscope	
4	43	In parasternal short axis (aortic valve level) we can see	
		(a) AV, PV, LA, RA, TV, RVOT	(b) Only LV
		(c) Only LA	(d) AV and LV only
		Ans:AV, PV, LA, RA, TV, RVOT	
4	44	In PET, the detectors are usually	
		(a) PMTs with scintillation crystals	(b) X-ray films
		(c) MRI coils	(d) Optical cameras
		Ans:PMTs with scintillation crystals	
4	45	IR thermography display unit shows	
		(a) CT scan	(b) Thermogram
		(c) MRI slice	(d) X-ray
		Ans:Thermogram	
4	46	In MRI, RF coil acts as	
		(a) Magnet	(b) Antenna for transmit/receive
		(c) X-ray tube	(d) Collimator
		Ans:Antenna for transmit/receive	
4	47	Photocoagulation targets	
		(a) Blue structures	(b) Red blood vessels
		(c) White tissues	(d) Bones
		Ans:Red blood vessels	
4	48	The type of ultrasound for fetal motion study is	
		(a) 2D	(b) 3D
		(c) 4D	(d) Doppler
		Ans:4D	
4	49	The control for exposure duration in X-ray machine is	
		(a) Thermal overload detector	(b) Pulse duration timer
		(c) Collimator	(d) Aluminium filter
		Ans:Pulse duration timer	
4	50	One application of IR imaging is	
		(a) Diagnosing rheumatoid arthritis	(b) Measuring lung capacity
		(c) Detecting broken bones	(d) Brain MRI
		Ans:Diagnosing rheumatoid arthritis	

UNIT	Q NO	QUESTIONS
5	1	Which of the following is a bioelectrical variable adaptable to biotelemetry? (a) ECG (b) Blood Pressure (c) Temperature (d) Respiration Rate **Ans:ECG**
5	2	Blood pressure is classified under which type of physiological variable in biotelemetry? (a) Bioelectrical (b) Physiological (c) Chemical (d) Mechanical **Ans:Physiological**
5	3	pH measurement in biotelemetry falls under: (a) Bioelectrical variable (b) Physiological variable (c) Biomechanical variable (d) None of these **Ans:Physiological variable**
5	4	Which parameter is NOT listed under physiological variables adaptable to biotelemetry? (a) Temperature (b) Blood Flow (c) EEG (d) Respiration Rate **Ans:EEG**
5	5	EMG in biotelemetry refers to measurement of: (a) Heart activity (b) Brain activity (c) Muscle activity (d) Blood flow **Ans:Muscle activity**
5	6	Which is the first component in a land line telemetry system? (a) Amplifier (b) Electrode/Transducer (c) Transmission Wire (d) Readout Device **Ans:Electrode/Transducer**
5	7	In radio telemetry, which block generates the RF carrier signal? (a) Processor (b) Modulator (c) Carrier Generator (d) Tuner **Ans:Carrier Generator**
5	8	Which device in radio telemetry recovers the original biosignal? (a) Modulator (b) Demodulator (c) Carrier Generator (d) Tuner **Ans:Demodulator**
5	9	Why is frequency modulation preferred over amplitude modulation in radio biotelemetry? (a) Less power needed (b) Avoid motion-induced amplitude changes (c) Simpler circuits (d) Avoid multipath **Ans:Avoid motion-induced amplitude changes**
5	10	In single channel radio telemetry, typical RF frequency range is: (a) 0–100 kHz (b) Few hundred kHz to 300 MHz (c) 300 MHz–1 GHz (d) Above 1 GHz **Ans:Few hundred kHz to 300 MHz**

UNIT	Q NO	QUESTIONS
5	11	In frequency division multiplexing, each channel modulates: (a) The main RF carrier directly (b) A subcarrier frequency (c) The audio signal (d) The power supply **Ans:A subcarrier frequency**
5	12	Which filter is used in the receiver to extract individual channels in FDM? (a) High pass filter (b) Band pass filter (c) Notch filter (d) Low pass filter only **Ans:Band pass filter**
5	13	In time division multiplexing, what controls the sequence of signal sampling? (a) Low pass filter (b) Scanning signal generator (c) Modulator (d) Amplifier **Ans:Scanning signal generator**
5	14	Limitation on TDM channel count is due to: (a) Bandwidth limit (b) Sampling period per channel (c) Noise (d) Modulation index **Ans:Sampling period per channel**
5	15	Which patient group MOST needs continuous monitoring? (a) Healthy adults (b) ICU patients (c) Medical students (d) Visitors **Ans:ICU patients**
5	16	Continuous monitoring during surgery mainly benefits: (a) Patient (b) Surgeon (c) Anesthesiologist (d) All of these **Ans:All of these**
5	17	Which parameter is NOT usually monitored in continuous patient monitoring? (a) ECG (b) Blood pressure (c) Heart rate (d) Hair growth **Ans:Hair growth**
5	18	The main goal of continuous monitoring is to: (a) Increase hospital bills (b) Decrease mortality/morbidity (c) Reduce paperwork (d) Avoid doctor visits **Ans:Decrease mortality/morbidity**
5	19	Bedside monitoring systems typically convert analog signals to digital using: (a) Oscilloscope (b) ADC (c) DAC (d) Amplifier **Ans:ADC**
5	20	Central Station Monitoring displays: (a) One patient at a time (b) All monitored patients (c) Doctors' schedule (d) Surgery video **Ans:All monitored patients**

UNIT	Q NO	QUESTIONS
5	21	Telemedicine is defined as delivery of healthcare via: (a) Postal service (b) Telecommunication & computer tech (c) Personal visits (d) Printed reports **Ans:Telecommunication & computer tech**
5	22	Which telemedicine method involves storing data for later review? (a) Real-time (b) Store-and-forward (c) Teleconferencing (d) Teleradiology **Ans:Store-and-forward**
5	23	Real-time telemedicine requires: (a) Email (b) Interactive communication (c) Printed records (d) Store-only devices **Ans:Interactive communication**
5	24	Teleradiology involves transmission of: (a) Pathology slides (b) Radiological images (c) ECG signals (d) Surgery videos **Ans:Radiological images**
5	25	Which telemedicine application sends ECG data to specialists? (a) Telepathology (b) Telecardiology (c) Teleeducation (d) Teledermatology **Ans:Telecardiology**
5	26	Electrical shock effect depends on all EXCEPT: (a) Current path (b) Body resistance (c) Contact area (d) Eye color **Ans:Eye color**
5	27	Let-go current for men is about: (a) 5 mA (b) 10.5 mA (c) 16 mA (d) 25 mA **Ans:16 mA**
5	28	Microshock is hazardous because current flows: (a) Through skin only (b) Through heart via catheter (c) Around the body surface (d) Only in feet **Ans:Through heart via catheter**
5	29	Macroshock generally involves current flowing: (a) Through skin to muscles (b) Across large body areas (c) Directly into heart only (d) Only through electrodes **Ans:Across large body areas**
5	30	Unequal ground potentials can cause: (a) Hair loss (b) Microshock (c) Only macroshock (d) Overheating **Ans:Microshock**

UNIT	Q NO	QUESTIONS
5	31	Leakage current in hospitals can be due to: (a) Ungrounded equipment (b) Proper grounding (c) Good insulation (d) Clean surfaces **Ans:Ungrounded equipment**
5	32	Static electricity hazard can occur due to: (a) Excess moisture (b) Dust in motor (c) Clean motors (d) Dry air only **Ans:Dust in motor**
5	33	Power failure in life support equipment can cause: (a) Macroshock (b) Microshock (c) Patient death (d) ECG artifacts only **Ans:Patient death**
5	34	Macroshock hazard is more in: (a) Three-wire system (b) Two-wire system (c) Battery systems (d) Isolated circuits **Ans:Two-wire system**
5	35	Grounding works by making: (a) Body resistance high (b) Ground resistance low (c) Voltage high (d) Current zero **Ans:Ground resistance low**
5	36	Main disadvantage of grounding method is: (a) Removes all hazards (b) Depends on good ground connection (c) Increases leakage (d) Needs high voltage **Ans:Depends on good ground connection**
5	37	Burns in electrosurgical units can occur due to: (a) Adequate electrode contact (b) Moisture near electrode (c) Low power setting (d) Proper insulation **Ans:Moisture near electrode**
5	38	A precaution to prevent burns in ESUs is: (a) High power setting (b) Wet cloth between limbs (c) Dry cloth between limbs (d) Avoid dispersive electrode **Ans:Dry cloth between limbs**
5	39	High frequency hazard in surgical diathermy is avoided by: (a) Removing capacitor (b) Connecting capacitor between indifferent lead and earth (c) Using higher voltage (d) Eliminating return electrode **Ans:Connecting capacitor between indifferent lead and earth**
5	40	In isolated ESU system, return electrode is: (a) Connected to earth (b) Floating (c) Shorted to live (d) Neutral grounded **Ans:Floating**

UNIT	Q NO	QUESTIONS
5	41	HF currents in electrosurgical units are used because: (a) They produce less neuromuscular stimulation (b) They produce stronger shocks (c) They reduce burns (d) They work without insulation **Ans:They produce less neuromuscular stimulation**
5	42	ESU dispersive electrode should be placed: (a) Over bony prominences (b) On fatty tissue (c) On muscle mass with good blood flow (d) Near ECG electrode **Ans:On muscle mass with good blood flow**
5	43	The indifferent plate in ESU is also called: (a) Neutral electrode (b) Active electrode (c) Floating electrode (d) Ground plate **Ans:Neutral electrode**
5	44	Which frequency range is used in surgical diathermy? (a) 50–60 Hz (b) 500 kHz–3 MHz (c) 3–30 MHz (d) 100–200 Hz **Ans:500 kHz–3 MHz**
5	45	Main aim of ESU safety design is: (a) Increase patient sensation (b) Minimize leakage current (c) Maximize spark length (d) Increase power **Ans:Minimize leakage current**
5	46	Which connection in ESU increases patient shock risk? (a) Floating return (b) Direct earth connection to patient electrode (c) Using isolated generator (d) Low HF voltage **Ans:Direct earth connection to patient electrode**
5	47	Capacitive coupling in ESU can cause: (a) Burns (b) Cooling (c) Less cutting (d) Less coagulation **Ans:Burns**
5	48	Using damaged cables in ESU may cause: (a) Less spark (b) More cutting (c) Electric burns (d) Lower current **Ans:Electric burns**
5	49	The active electrode in ESU should be kept: (a) In contact with patient always (b) Away from patient when not in use (c) Near dispersive plate (d) Touching ECG leads **Ans:Away from patient when not in use**
5	50	HF current hazard prevention involves: (a) Grounding patient (b) Avoiding contact with conductive fluids (c) Using high leakage current (d) Eliminating insulation **Ans:Avoiding contact with conductive fluids**

PART B/C	UNIT NO	Q.NO	QUESTION
B	1	1	Explain depolarization and repolarization, with waveform representation.
B	1	2	With a neat block diagram, explain the functions of the Central Nervous System (CNS).
B	1	3	Explain the working of the Cardiovascular System, with a simple diagram.
B	1	4	Describe the Respiratory System, with a neat sketch.
B	1	5	Draw a functional block diagram of the Urinary System, and briefly explain it.
B	1	6	Define a microelectrode and explain its types with diagrams.
B	1	7	What is the use of a needle electrode? Explain any two types of needle electrodes.
B	1	8	Describe the skin surface electrode and its types.
B	1	9	What is a biomedical transducer? Explain its types.
B	1	10	Define biomedical signal conditioning and briefly explain it with a neat diagram.
B	2	1	What is ECG? Mention any two clinical uses of ECG.
B	2	2	Draw and briefly explain an ECG recorder.
B	2	3	Explain any one lead system used in ECG.
B	2	4	What is EEG? Draw the block diagram of an EEG recorder.
B	2	5	Discuss the different EEG waves.
B	2	6	What is EMG? Discuss the recording unit of EMG.
B	2	7	What do you mean by SpO_2 monitoring? Explain the construction and working of a pulse oximeter.
B	2	8	Explain briefly how to measure blood pressure using a sphygmomanometer.
B	2	9	Explain briefly how ERG waves are recorded using an ERG recorder.
B	2	10	Explain the working of an audiometer with a neat diagram.
B	3	1	Discuss briefly about electrotherapy devices.
B	3	2	What is a cardiac pacemaker? Explain briefly about implantable pacemakers.
B	3	3	Explain an R-wave triggered pacemaker with a neat diagram.
B	3	4	Explain briefly about implantable cardiac defibrillators.
B	3	5	Write short notes on therapy devices.
B	3	6	Discuss in detail about hemodialysis.
B	3	7	Explain briefly about peritoneal dialysis.
B	3	8	Explain briefly about a modern ventilator with a neat diagram.

B	3	9	Discuss briefly about a heart-lung machine.
B	3	10	Differentiate between pacemakers and defibrillators.
B	4	1	Explain briefly the working of echocardiography.
B	4	2	Explain echocardiographic imaging in detail.
B	4	3	Explain briefly the working of an X-ray machine.
B	4	4	Write briefly about computerized tomography with a neat diagram.
B	4	5	Explain positron emission tomography (PET) and its applications.
B	4	6	Explain infrared imaging and its applications with a neat diagram.
B	4	7	Explain the principle and working of magnetic resonance imaging (MRI).
B	4	8	Draw the block diagram of an MRI system and list its components.
B	4	9	Explain briefly about laser endoscopy imaging techniques.
B	4	10	Explain briefly the working of PET with a neat diagram.
B	5	1	What is biotelemetry? List the physiological parameters adaptable to biotelemetry.
B	5	2	With a neat diagram, explain a single-channel telemetry system.
B	5	3	Explain how multi-channel telemetry can be implemented using any one multiplexing technique.
B	5	4	Explain briefly about chronic disease management techniques.
B	5	5	Explain briefly about post-discharge monitoring.
B	5	6	Describe telemedicine in detail and explain its applications.
B	5	7	Describe in detail the shock hazards from electrical equipment.
B	5	8	List the methods of accident prevention and explain the importance of grounding.
B	5	9	Describe briefly any two safety aspects in an electrosurgical unit.
B	5	10	Explain the physiological effects due to the passage of current through the human body.
C	1	1	Draw a neat block diagram of the Central Nervous System (CNS) and explain the functions of each part in detail.
C	1	2	With the help of a simple block diagram, explain the working principle of the Cardiovascular System.
C	1	3	Describe the human Respiratory System with a neat sketch and explain its working mechanism.
C	1	4	Draw the functional block diagram of the Urinary System and explain the functions of each block briefly.
C	1	5	Explain the construction, working principle, and types of microelectrodes with neat diagrams.
C	2	1	Draw the block diagram of an ECG recorder and explain the working of each stage briefly.
C	2	2	Draw a neat block diagram of an EEG recording system and explain its

			operation.
C	2	3	What is EMG? Explain the EMG recording unit with a neat block diagram.
C	2	4	Explain the indirect method of measuring blood pressure using a sphygmomanometer with a neat diagram.
C	2	5	Draw a neat block diagram of an audiometer and explain its working principle and applications.
C	3	1	With a neat diagram, explain the construction and working of an R-wave triggered pacemaker.
C	3	2	Explain the principle, construction, and working of an Implantable Cardiac Defibrillator (ICD).
C	3	3	Discuss in detail the principle, construction, and working of a hemodialysis system with a neat diagram.
C	3	4	Draw a neat block diagram of a modern ventilator and explain its working briefly.
C	3	5	Explain the construction and working of a heart–lung machine and list its applications.
C	4	1	Explain the principle and working of echocardiography with a neat diagram.
C	4	2	With the help of a block diagram, explain the construction and working of an X-ray machine.
C	4	3	Draw the block diagram of an MRI system and explain the function of each component.
C	4	4	Explain the principle and working of laser endoscopy imaging techniques with suitable diagrams.
C	4	5	With a neat diagram, explain the working principle of Positron Emission Tomography (PET).
C	5	1	Draw a neat block diagram of a single-channel biomedical telemetry system and explain its working.
C	5	2	Explain how multi-channel biomedical telemetry can be implemented using any one multiplexing technique with a block diagram.
C	5	3	Define telemedicine. Explain the telemedicine system architecture and discuss its applications in healthcare.
C	5	4	Discuss any two safety aspects of an electrosurgical unit with suitable explanations.
C	5	5	Explain the physiological effects of electric current on the human body with respect to magnitude and duration of current flow.