Scoring Indicators

COURSE NAME: MEDICAL ELECTRONICS

COURSE CODE: 6041A **QID : 2102240071**

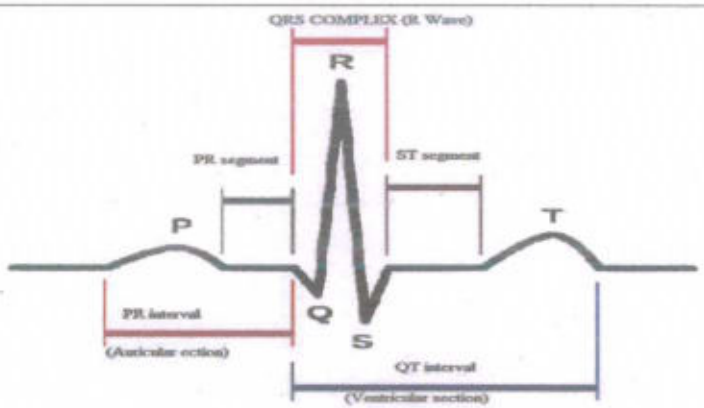
PART A

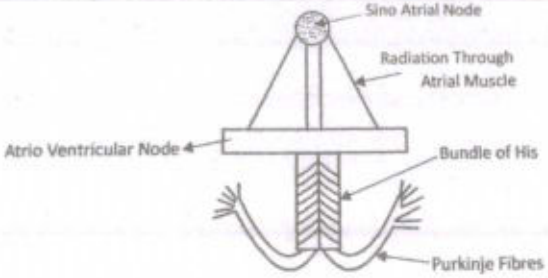
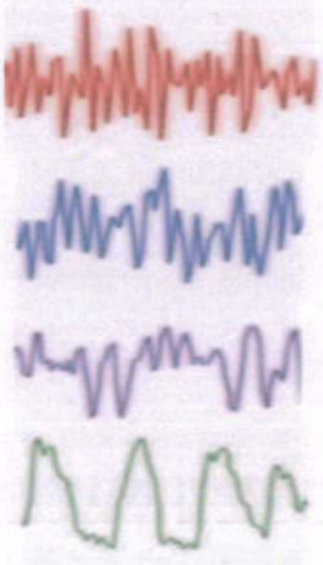
I. Answer all the following questions in one word or sentence.

(9 x 1 = 9 Marks)

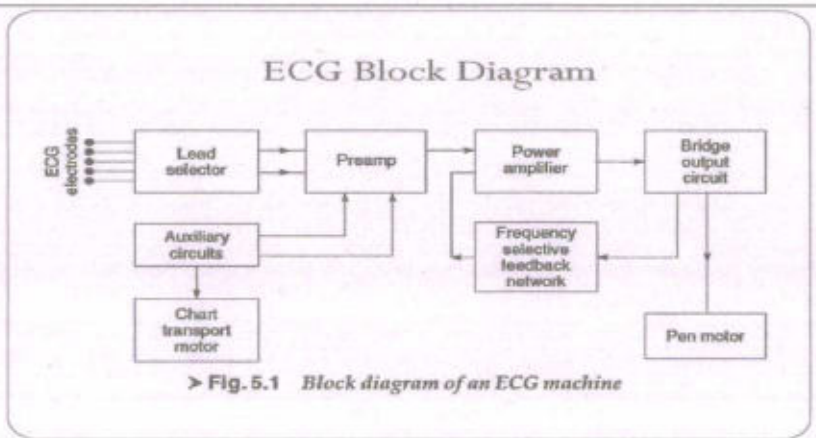
Max. marks :75

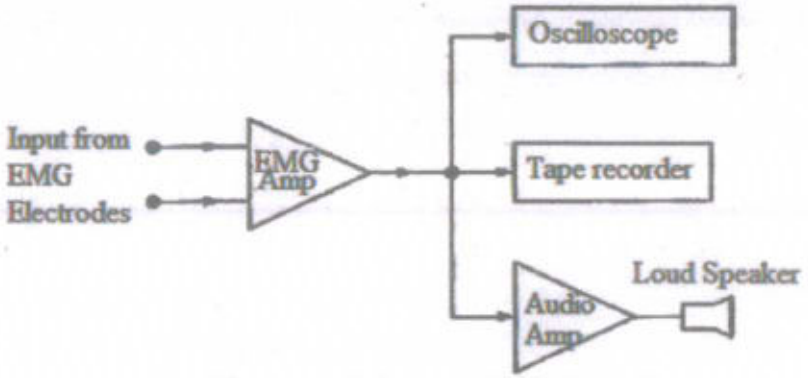
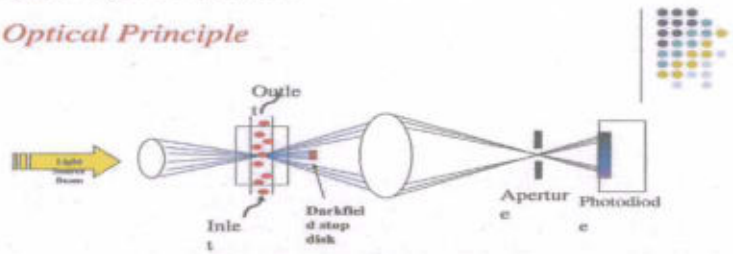
Q.No.	Scoring Indicators	Split score	Sub Total	Total score
	PART A			9
I.1	Skeletal, muscular, nervous, endocrine, cardiovascular, lymphatic, respiratory, digestive, urinary, and the reproductive system (any two).	1	1	
I.2	An action potential is a rapid sequence of changes in the voltage across a cell membrane.	1	1	
I.3	Light amplification by stimulated emission of radiation.	1	1	
I.4	Systolic pressure-120mmHg, diastolic pressure- 80mmHg.	1	1	
I.5	The need for defibrillator generally arises when the patient has ventricular fibrillation or ventricular tachycardia, which are life-threatening arrhythmias that occur when contraction of the ventricles become abnormal.	1	1	
I.6	A machine designed to mechanically move breathable air into and out of the lungs to provide the mechanism of breathing for a patient who is physically unable to breathe.	1	1	
I.7	The measurement of biological parameters over a distance.	1	1	
I.8	Micro shock refers to the risk of electric shock to a person from	1	1	

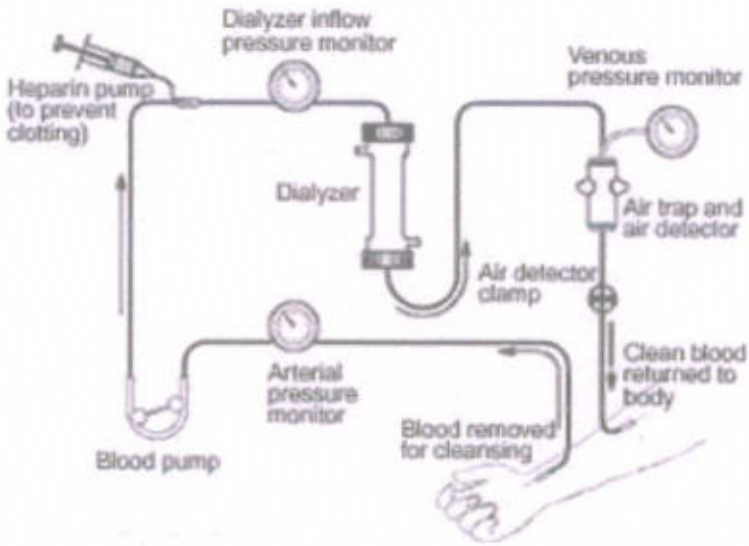
	very small currents that pass through the body, typically during medical procedures that involve direct contact with the heart or other internal tissues.			
I.9	1. To generate a picture of organs and tissues in the body. 2. It is a non-invasive imaging test that is uses high-frequency sound waves to create real-time pictures. 3. It is used to examine the fetus during pregnancy and monitor the health of the developing baby. 4. It is used to evaluate blood flow and figure out problems. 5. It used to examine lumps in the breast, thyroid gland, and to assess joint inflammation. (any two)	1	1	
	PART B			24
II.1		Draw -2 label -1	3	
II.2	The surface electrodes used to measure the potential available from the surface of the skin and these are used to sense the potential from heart, brain, and nerves. The smaller area surface electrodes are used to measure EEG,EMG potentials and the larger area surface electrodes are used to measure ECG potentials. Depends on construction, the surface electrodes are classified into 1. Metal plate electrode 2. Suction cup electrode 3. Adhesive tape electrode 4. Multipoint electrode 5. Floating electrode	3	3	

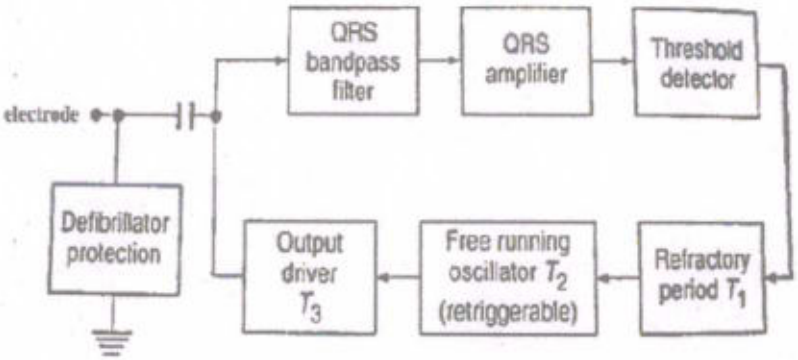
II.3	 1.The impulses for cardiac contraction start at sinoartrial node.SA node is situated in the wall of the right artrium and near the entry of venacava.It is called pacemaker of heart. 2. The impulses then pass through the atrial muscle. 3 Later the impulses pass to atrioventricular node (AV node). It lies in the upper part of atria-ventricle septum. AV node acts as a delay line. 4. From here, the impulses pass through Bundle of His. It is a special bundle of nerves and muscle tissue. Also, it is the only muscular connection between the atria and ventricles. 5. The Bundle of His passes through the interventricular septum. Later it divides into branches called Purkinje, fibres. The right and left branches of this fibre supply the two ventricles. The waveform produced by the action potentials of heart is called the electrocardiogram (ECG).It is a written record (graph) of the cardiac electrical potential.	3	3	
II.4		Explanation 2 wave 1	3	

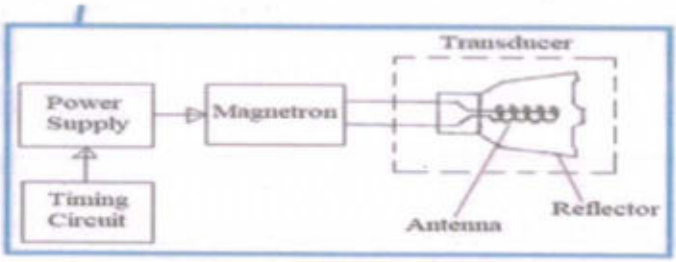
II.5	1. Monochromaticity. 2. Spatial and temporal coherence. 3. Directionality 4.variable wavelength 5.Brightness 6. Can be operated in continuous mode or pulsed mode. (any three)	3	3	
II.6	1.For the treatment of cardiac rhythm disorders. 2. For the treatment of Brady arrhythmias and tachy arrhythmias. 3. In any pathological abnormalities in the SA node,AV node and His Purkinje system. 4.In the cases of heart block like AV node block and left bundle branch block.	3	3	
II.7	The pressure cycled ventilator, the inspiration is terminated when the gaseous mixture or air pumped into the lungs reaches a predetermined pressure. These are simple in construction and reliable in operation.	3	3	
II.8	1. They are propagate with a speed of 3×10^{10} cm/s. 2.They are unaffected by electric and magnetic fields. 3. Short wavelength and extremely high energy. 4. Can penetrate through the materials which absorb and reflect visible light. 5. X rays produce secondary radiation. 6.It affect photographic film in the same way as ordinary visible light. (any three)	3	3	

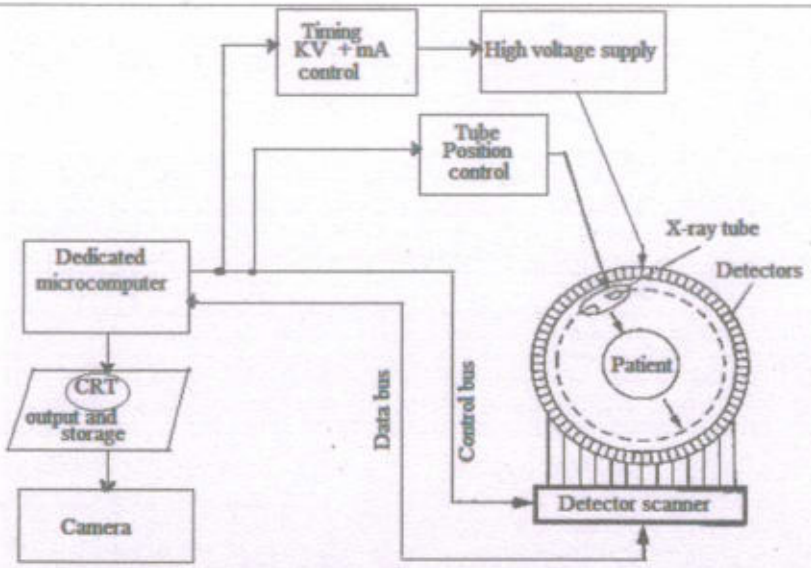
II.9	<table><tr><th>Current (mA)</th><th>Response</th></tr><tr><td>0.2-2</td><td>"Electrical" sensation</td></tr><tr><td>1-2+</td><td>Painful shock</td></tr><tr><td>3-5</td><td>Let-go threshold for children</td></tr><tr><td>6-10</td><td>Minimum let-go threshold for adults</td></tr><tr><td>22</td><td>99% of adults cannot let go</td></tr><tr><td>10-20</td><td>Tetany (contact area)</td></tr><tr><td>20-50</td><td>Tetany (respiratory muscles)</td></tr><tr><td>50-100</td><td>Ventricular fibrillation</td></tr></table> (any six)	3	3	
II.10	Grounding shields the patient from all sources of electrical shock. It is best to connect to one common point called Equipotential Patient Rreference(EPR) all the nearby metal surfaces and all electronic devices to which the patient is attached. An improperly grounded electrical system is a hazard to life and property. It can damage or destroy appliances Harm or kill those who come in contact with those appliances. Proper electrical earthing ensures that machines function reliably and accurately, reducing the risk of malfunctions or damage caused by electrical faults. This not only safeguards patient care but also maintains the efficiency of critical medical procedures.	3	3	
	PART C			42
III	 ➢ Fig. 5.1 *Block diagram of an ECG machine*	Block daigram 4 explanation 3	7	

IV	 **Fig.2.23 Block diagram of EMG Recorder**	Block diagram 4 explanation 3	7	
V	1. First, a cuff is placed around your left arm . 2. It is inflated with a pump until the blood circulation is cut off.(160 mm Hg) . 3. Doctor measuring blood pressure uses a stethoscope, placed over your arm, to listen for the sound of blood pulsing through the arteries. 4. Now no sounds can be heard through stethoscope. 5.Now pressue in the cuff is released. 6.As the pressure falls below the systolic pressure, blood flow starts with turbulence . 7. The sounds generated by this turbulence ,KOROTKOFF SOUND , can be heard though stethoscope. 8. That first sound of rushing blood refers to the systolic blood pressure; 9As the pressure continues to drop blood flow becomes normal and sound disappears. 10. The manometer reading when the sound disappears indicates the diastolic pressure.	7	7	
VI	Automatic Optical Method:  Based on collecting scattered light from the blood cells and converting it into electrical pulses for counting. A sample	diagram 4 explanation 3	7	

	optical system provides a dark field illuminated zone on the stream and the light scattered in the forward direction is collected on the cathode of a photomultiplier tube. Pulses are produced in the photomultiplier tube corresponding to each cell. These signals are amplified in a high input impedance amplifier and fed to an adjustable amplitude discriminator. The discriminator provides pulses of equal amplitude, which are used to drive a digital display- Accuracy of2% is attainable.			
VII	Hemodialysis is a process that involves the removal of toxic chemical substances from the blood by passing the blood through tubes surrounded by semi-permeable membranes.  In hemodialysis, your blood is removed from your body, a few ounces at a time through some form of IV access. A machine pumps the blood through tubing to a filter, or dialyzer. The dialyzer is a canister that contains thousands of fibers that filter out the wastes and extra fluid. The clean blood is then pumped through tubing and returned to the body. Removing the harmful wastes and extra salt and fluids helps control blood pressure and keep the proper balance of chemicals like potassium and sodium in the body.	diagram 4 explanation 3	7	

VIII	**Compare AC and DC defibrillators** **AC defibrillators** / **DC defibrillators** Simple and easy to operate / Simple and safe to operate Large currents are required for external defibrillators / High energy shock is given by discharging a capacitor This current causes violent / No desirable side effects. Produces normal heart beat / Produces normal heart beat effectively. Occasional burning of the skin under electrodes. / No skin burns. Only an alternating wave is used to deliver the shock. / Different voltage waveforms can be selected to deliver the shock. Shock cannot be synchronized with ECG to correct fibrillation at the right time. Not very effective / Shock can be synchronised with ECG to correct fibrillation at the right time. Very effective. It produces atrial fibrillation while arresting ventricular fibrillation. / No such effects are observed. The technician administering the shock is unsafe. / The technician administering the shock is safe.	7	7	
IX	 It allows heart to pace at its normal rhythm when it is able to. If heart fails or R wave is missing, the pacemaker will turn on and provide pulses. Hence it is called demand pacemaker. Further there is a sensor to detect the patient's body activity and accordingly the pacemaker automatically increases or decreases its rate. • It is used in case of occasional rhythm failure in SA note. • it uses feedback to read R wave and triggers ventricles with some delay. • It Senses the natural operation that is R wave generated by SA node. delay between two adjacent pulses increases or decreases, it takes the control and generates trigger pulses to the ventricle . Same electrode is used for sending trigger signal to the heart and also for sensing R wave from SA node. • It has two functions- pacing and sensing	diagram 4 explanation 3	7	
X	Microwave diathermy heats tissue by exposing the treated tissue to a strong electromagnetic field. A frequency of 2450			

	MHz is generated by most microwave diathermy units. The high frequencies of micro thermy are obtained from a unique device called the magnetron, which is perforated with tiny holes, through which the electrons flow into the treatment heads. The special design of the treatment heads shapes and focuses the field directly at the target area.  Superficial and deep heating Frequency: 300 MHz to 300 GH. Wavelength: 1m to 1mm .	diagram 4 explanation 3	7	
XI	**Red Blood Cells (RBC)** Red blood cells consist of Haemoglobin, a protein. They are produced by the bone marrow to primarily carry oxygen to the body and carbon dioxide away from it. **White Blood Cells (WBC)** White blood cells are responsible for fighting foreign pathogens (such as bacteria, viruses, and fungi) that enter our body. They circulate throughout our body and originate from the bone marrow. **Platelets** Tiny disc-shaped cells that help regulate blood flow when any part of the body is damaged, thereby aiding in fast recovery through clotting of blood. **Plasma** The liquid state of blood can be contributed to plasma as it makes up ~55% of blood. It is pale yellow in colour and when separated. Blood plasma consists of salts, nutrients, water and enzymes. Blood plasma also contains important proteins and	7	7	

	other components necessary for overall health. Hence, blood plasma transfusions are given to patients with liver failure and life-threatening injuries.			
XII	1.Opthalmology 2.Gynecology 3.Gastroenterology 4.Dermatology 5.Oncology 6.orthopaedics 7. urology 8 . Neurosurgery 9. Lung cancer diagnosis. (any seven)	7	7	
XIII	 Fig.5.14 System components of CT (CAT) scanner	diagram 4 explanation 3	7	
XIV	1. Regular inspection and maintenance 2. Conformity to regulatory standards 3. Appropriate instruction and training 4. Efficient inventory control	7	7	

	5. Safe transport and storage 6. Conformity with infection control protocols 7. Calibration and preciseness (any seven)			