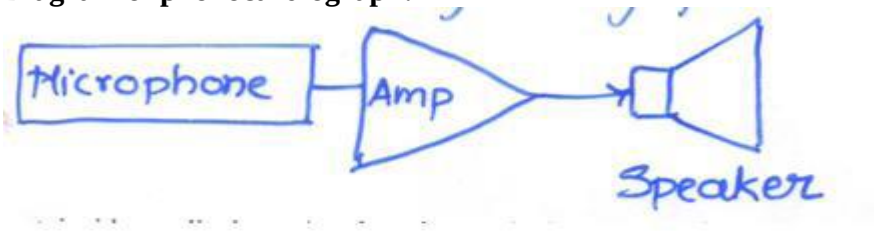
Important Instructions to examiners:

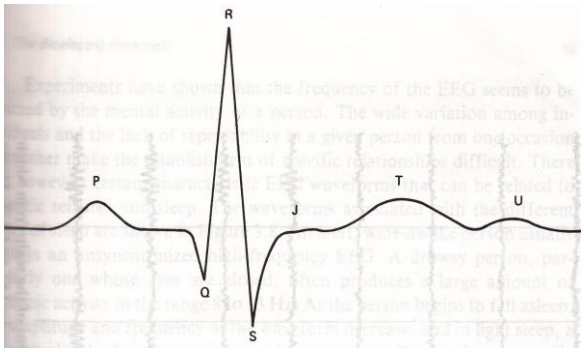
1) The answers should be examined by keywords and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling errors should not be given more Importance. (Not applicable for subject English and Communication Skills.)
4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for any equivalent figure drawn.
5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.
7) For programming language papers, credit may be given to any other program based on equivalent concept.

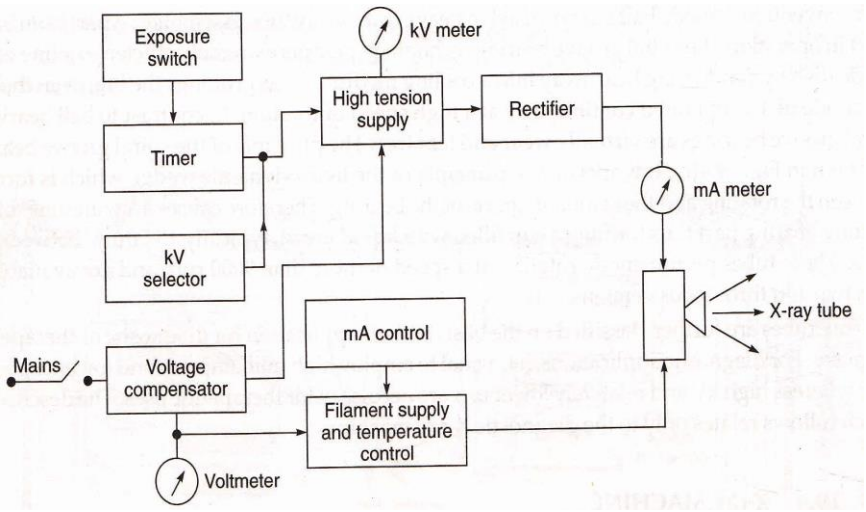
Q. No.	Question & its Answer	Remark	Total Marks
01	**Attempt any FIVE of the following**		**20**
a	**List basic types of electrodes for measurement of bio-electric potentials**		**04**
Ans	**(Any FOUR electrodes)** Electrodes for ECG: 1) Limb electrodes 2) Floating electrodes 3) Pasteless electrodes 4) Pre-jelled disposable electrodes 5) Air-jet ECG electrodes Electrodes for EEG: 1) Surface electrodes 2) Chlorided silver discs electrodes Electrodes for EMG: 1) Needle type EMG electrodes 2) Hypodermic needle type EMG electrodes	**01 Mark each electrode**	
b	**State main function of:** **i) Heart ii) Medulla Oblongata iii) Lungs iv) Arota**		**04**
Ans	**i)heart:** 1)It is a muscular organ that functions as the body's circulatory pump 2. It takes in deoxygenated blood through the veins and delivers it to	**01 Mark each**	

	the lungs for oxygenation. 3. The oxygenated blood then supplied to various arteries, heart provides oxygen and nutrients to body tissues by transferring the blood throughout the body. **ii)Medulla Oblongata:** It is part of brain stem and functions are as follows 1) It control blood distribution 2) Respiratory centers which controls the ventilation of the lungs. 3) reflex center of vomiting, 4) coughing, seezing 5) Swallowing. Or It contain nuclei for regulating i) Blood pressure ii) breathing iii) also responsible for information from sense organs that comes from cranial nerves **iii) Lungs :** 1) It helps in respiration 2) It consists of small alveoli where exchange of O2 & CO2 takes place during respiration 3) It supplies oxygenated blood to heart for systematic circulation 4)Changing of pH of blood by increasing or decreasing the amount of CO2 in the body 5) Filtering out small gas bubbles that may occur in the blood stream. **iv) Aorta** 1)Aorta distributes oxygenated bloods to all parts of the body through systematic circulation. 2)It is largest artery in the body begins at top of the left ventricle.		
c	**Explain with neat block diagram the working of Phonocardiograph.**		**04**
Ans	**Explanation:** The instrument used for graphically recording heart sound is called phonocardiograph. A graphic record of heart sounds is	03 **Mark** for	

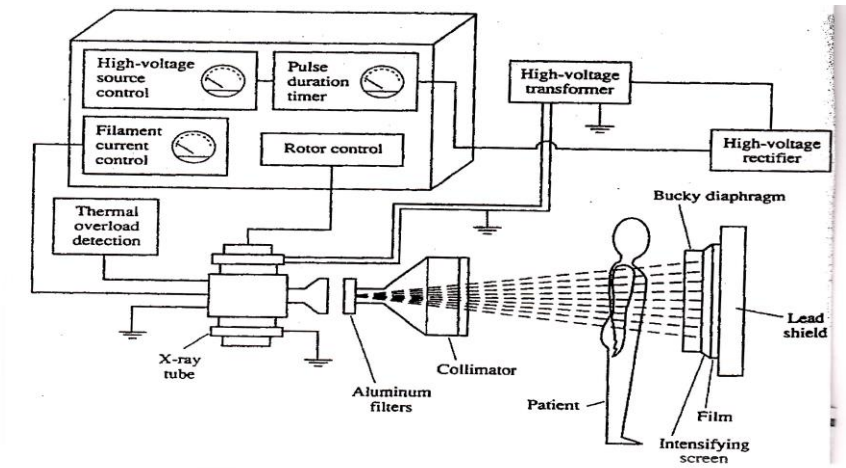
	called phonocardiogram. The basic transducer for the phonocardiogram is a microphone having necessary frequency response ranging from 5 Hz to above 1000Hz. An amplifier with similar response characteristics is required which may offer a selective low pass filter to allow the high frequency cut off to be adjusted for noise. The readout of a phonocardiograph is either a high frequency chart recorder or an oscilloscope. Although the normal heart sounds fall within the frequency range of pen recorders, the high frequency murmurs that are often important in diagnosis require the greater response of phonographic device. Microphones for phonocardiograms are designed to be placed on the chest over the heart. **Diagram of phonocardiograph:** 	explanation 01 **Mark** for diagram	
d	**Classify pacemakers. Explain any one type in brief.**		**04**
Ans	Classification: 1) Internal pacemakers 2) External pacemakers Explanation: **Internal pacemakers:** May be permanently implanted in patients whose SA nodes have failed to function properly or who suffer from permanent heart block because of heart attack. An internal pacemaker is defined as one in which the entire system is inside the body. Internal pacemaker system are implanted with the pulse generator placed in a surgically formed pocket below the right or left clavicle in the left subcostal area. Internal leads connect to electrodes that directly contact the inside of the right ventricle or the surface of myocardium. As There are no external connections for applying power, the pulse generator must be self-contained with a power source capable of continuously operating the unit for a period of years. **OR** **External pacemakers:** It consist of an externally worn pulse generator connected to electrodes located on or within the myocardium.	01 **Mark** for classification 03 **Mark** explanation	

	It is used on patient with temporary heart irregularities such as those encountered in coronary patient including heart block also used in temporary management of certain arrhythmias also in patients during cardiac surgery which involves valves or septum. It includes all types of pulse generators located outside the body. It is connected through wires introduced into right ventricle via a cardiac catheter. The pulse generator may be strapped to the lower arm of a patient who is confined to bed.		
e	**State two applications of each:** **i) Ultrasonography ii) X-rays**		**04**
Ans	Applications : **Ultrasonography: (any two)** 1. Locating abnormal structures in body.(soft tissues) 2. Studies of abdominal structure such as liver, pancreas and kidneys. 3. Localization of tumors. 4. Distinction between cystic masses and solid structures. **X ray: (any two)** 1. Used in medicine to detect fractures in bones or presence of foreign body. 2. Used in diagnosis of tuberculosis, ulcers, cancer etc. 3. In industry they are used to test metal castings and moulds and also to detect cracks in them. 4. They are used to test the genuineness of the diamonds and pearls. 5. They are used to study the crystal structure.	**01 Mark each application** **01 Mark each application**	
f	**State the working principle of centrifuge. State its two applications.**		**04**
Ans	**Working principle:** A centrifuge is a piece of equipment that puts an object in rotation around a fixed axis used to separate two immiscible substances. The centrifuge involves the principle of sedimentation where the acceleration at centripetal force causes denser substances to separate out along the radial direction at the bottom of the tube. By the same concept lighter objects will tend to move to the top of the tube.	**02 Mark principle**	

	Applications: (any two) 1. Used in laboratory: used in chemistry, biology, biochemistry and clinical machine for isolating and separating suspensions and immiscible liquids. 2. Used in nuclear power and nuclear weapon program. 3. Used in geotechnical metalling for physical testing of models involving soils.	**01 Mark each application**	
g	**Draw a neat labeled typical ECG waveform. Explain it in brief.**		**04**
Ans	**Diagram for ECG Waveform**  **Explanation** ECG waveform: electrocardiography (ECG) is the process of recording the electrical activity of the heart over a period of time using electrodes placed on a patient's body. Fig shows a typical ECG as it appears when recorded from the surface of the body. P-Wave: is designated as the baseline or the isopotential line. It represents depolarization of the arterial musculature. QRS Complex: is the combined result of the repolarization of the atria & the depolarization of the ventricles which occurs almost simultaneously. T- Wave is the wave of ventricular repolarization. U-Wave – if present is generally believed to be the result of after potentials in the ventricular muscle. P-Q interval : represents the time during which the excitation wave is delayed in the fibers near AV node.	**02 Mark diagram** **02 Mark explanation**	

	The information written in bracket is optional. **(** Some normal values for amplitudes & durations of important ECG parameters Amplitude P-Wave 0.25mV R-Wave 1.60 mV Q-Wave 25% of R-Wave T-Wave 0.1 to 0.5 mV Duration: P-R interval 0.12 to 0.20 sec Q-T interval 0.35 to 0.44 sec g-T interval 0.05 to 0.15 sec P-Wave interval 0.11 sec QRS interval 0.09 sec **)**		
Q.2	**Attempt any TWO of the following**		**16**
a	**Draw a block diagram of X-ray machine. Explain its working in detail.**		**08**
Ans	**Block Diagram of X ray :** 	04 marks for block diagram	

OR



OR any other relevant block diagram of X-Ray machine

Explanation :

- X ray machine has two parts of the ckt.

i) One of them is to produce high voltage which is applied to tubes anode and cathode and comprises high voltage step up transformer followed by rectification. The current through the tube follows the high tension path way and is measured by mA meter.

A kV selector switch facilitates change in voltage between the exposures. The voltage is measured with the help of kV meter.

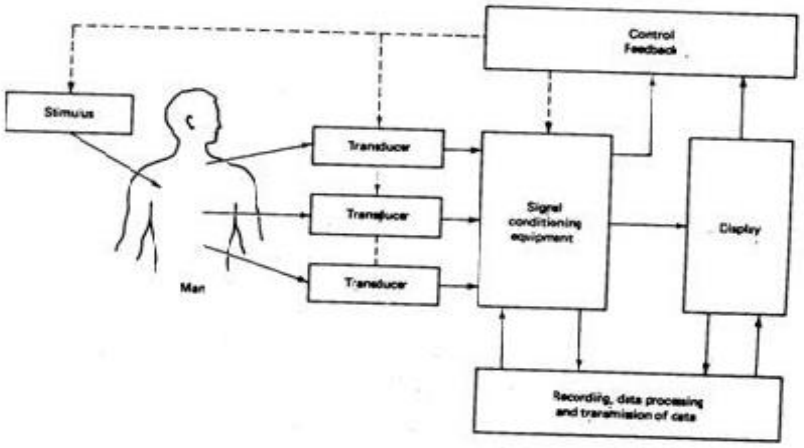
The exposure switch controls the timer and thus the duration of application of kV. To compensate mains supply voltage variation a voltage compensator is included in the circuit.

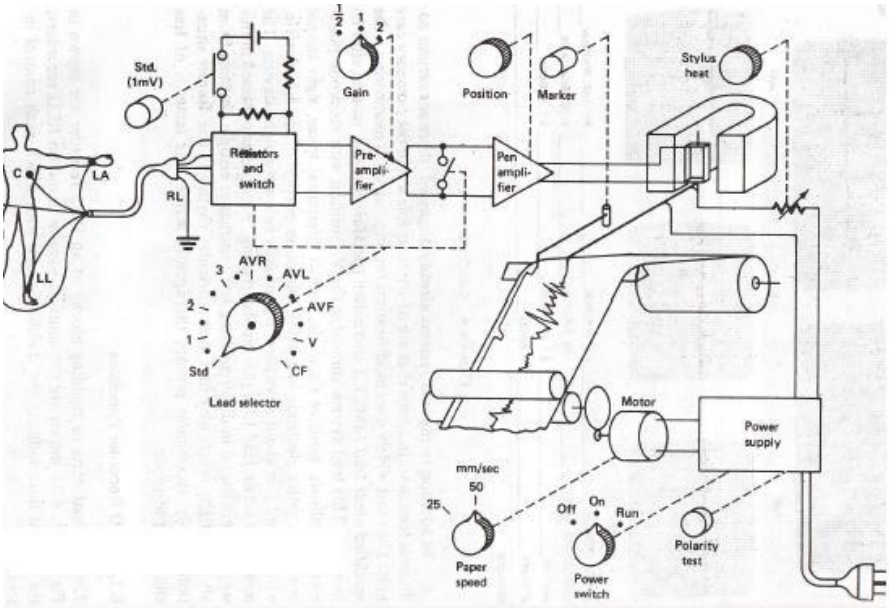
ii) Second part concerned the heating X-Ray tube filament; the filament is heated with 6-12 volts of AC Supply at current of 3-5 A.

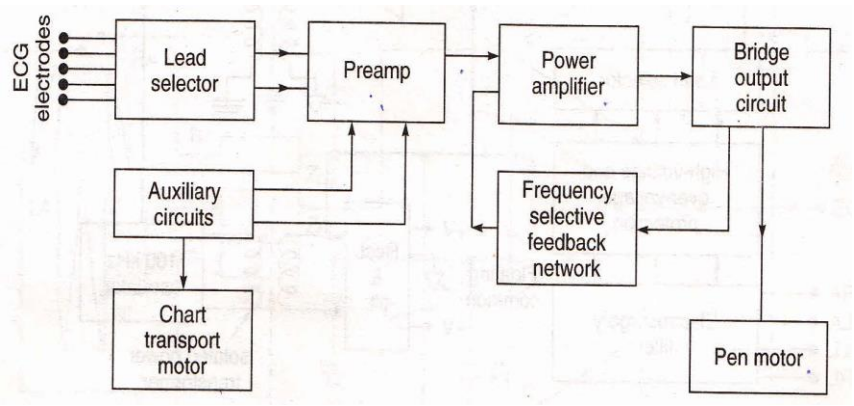
The filament temperature determines the tube current and therefore the filament temp control is attached with millimeter selector.

The filament current is controlled by using in the primary side of the filament transformer, a variable choke or rheostat. The rheostat provides a step wise control of mA and is most commonly used in

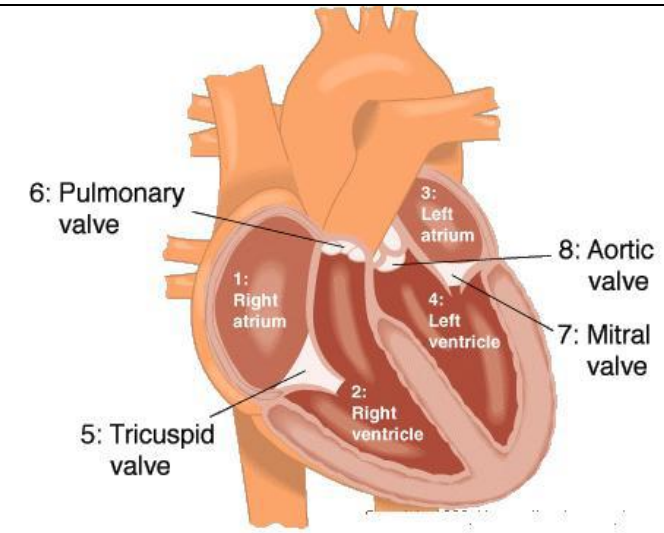
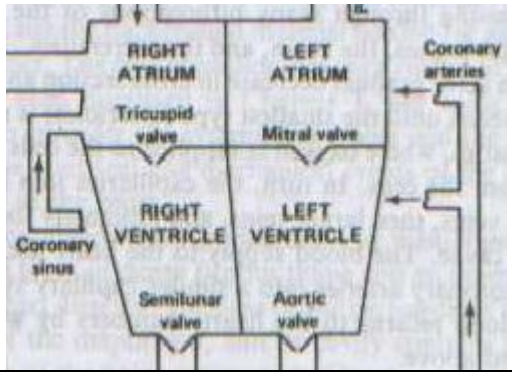
04 marks for explanation

	modern machine. A preferred method of providing high voltage dc to the anode of X-Ray tube is by use a bridge rectifier using 4 valve tube or solid state rectifiers, which provide more efficient system than the half wave self rectification method		
b	**Draw the neat and labeled block diagram of Man-Instrument system. Explain the function of each block.**		**08**
Ans	**Block diagram of Man – Instrument system:**  	04 marks for block diagram	
	Function of Man – Instrument system : The basic components of the man instrument system are: 1. **Subject**: The subject is the human being on whom the measurements are made. 2. **Stimulus**: Stimulus generates response. The instrumentation used to generate and present this stimulus to the subject is the vital part of man-instrument system whenever responses are measure. E.g. visual (flash of light), auditory (a tone), etc. 3. **Transducer**: A transducer is device used to produce an electrical signal that is an analog of the phenomenon being measured. 4. **Signal conditioning equipment**: This part of the system amplifies, modifies, or in any other ways changes the electric output of the transducer to satisfy the functions of the system and to prepare signals suitable for operating the display or recording equipment that follows. 5. **Display equipment**: The input to the display device is the modified electric signal from the signal conditioning	04 marks for explanation	

	equipment which is converted into a form that can be perceived by one of the human's senses in a meaningful way. E.g. graphic pen recorder for recoding ECG signal. 6. **Recording, Data processing, and Transmission**: Recording instruments are required to record the desirable information that can be used to transmit or for further processing. E.g. on line digital computer, recording equipment etc. 7. **Control devices**: Where it is necessary or desirable to have automatic control of the stimulus, transducers, or any other part of the man instrument system, a control system is incorporated which uses control devices.		
c	**Define electrocardiogram. Describe ECG system with the help of neat and labeled diagram**		**08**
Ans	Definition: Electrocardiogram is the recording of the bio potentials of the heart. **OR** ECG is recording of biopotential due to electrical activity of human heart **Or any relevant definition should be considered.** **Diagram of ECG system :**  	01 mark for definition 03 mark for diagram	

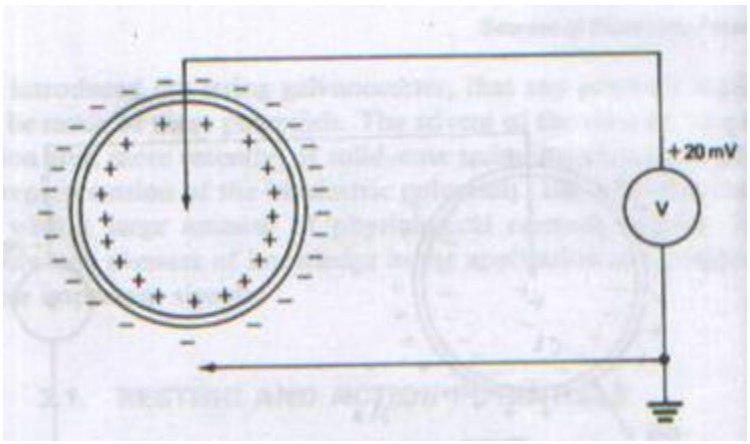
	OR  **Explanation :** • The potential picked up by the electrodes are taken to the lead selector where lead whose output is required are selected as per lead wire configuration • By means of capacitive coupling the signal is connected to the differential pre amplifier. • The preamplifier is usually a 3 or 4 stage differential amplifier having sufficiently large negative current feedback. • The amplified output signal is given to the power amplifier. • The power amplifier is a push-pull type. The base of one input transistor is driven by pre amplified signal and the base of other is driven by feedback network. • The output of power amplifier deflects the writing arm. • Paper recording speed is 25 mm/s • Amplitude measurements are made vertically made in mV • Sensitivity of electrocardiograph is typically set to 10mm/mV • It includes speed control circuit for a chart drive motor	04 marks for explanation	
Q.3	**Attempt any FOUR of the following**		**16**
a	**List various effects of leakage current that occur with the increasing current intensity on human body.**		**04**
Ans	List of effect of current on human body with increasing current intensity**(any four)** i) Threshold of perception: It is at approximately 500 micro A or 1 mA. ii) Accepted safe level: it is up to 5 mA. It is not considered	01 mark for each list	

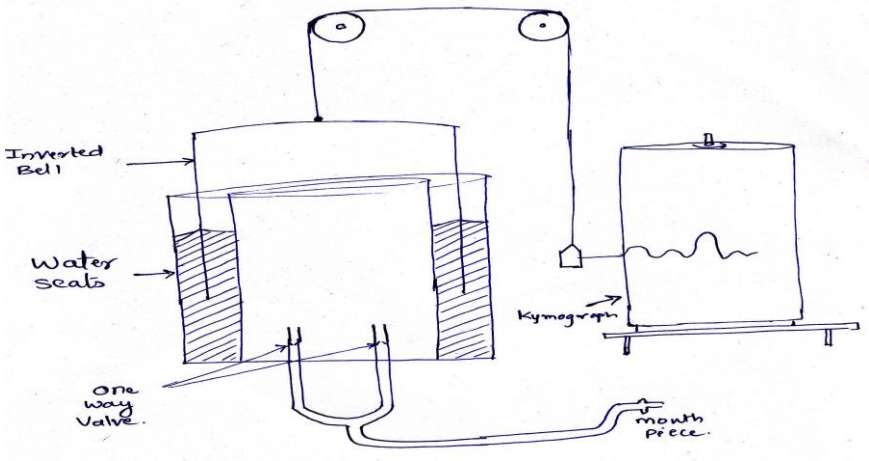
<table>
<tr><td></td><td>harmful.
iii) Maximum let go current: It is in excess of 10mA or 20mA.It can tentize the arm muscle.
iv) Danger of ventricular Fibrillation : It is above 75 mA
v) Contraction of heart (Sustained myocardial contraction): it is at excess of 1A or 2A current.
vi) Severe burns and physical injury: It is at excess above 10A current.
vii) Danger of respiratory paralysis: It is current excess at 100mA onwards.</td><td></td><td></td></tr>
<tr><td>b</td><td colspan="2">Compare internal and external pacemaker (any four points)</td><td></td><td>04</td></tr>
<tr><td>Ans</td><td colspan="2"><table>
<tr><th>Internal Pacemaker</th><th>External pacemaker</th></tr>
<tr><td>i) Entire system (electrodes and pulse generator) is implanted inside the body.</td><td>In this electrodes are placed inside the body and pulse generator is implanted outside the body.</td></tr>
<tr><td>ii) It is used on patient having permanent heart block</td><td>It is used on patient having temporary heart irregularities.</td></tr>
<tr><td>iii) The electrodes used are myocardial type</td><td>iii) The electrodes used are endocardial type</td></tr>
<tr><td>iv)Battery replacement needs minor surgery</td><td>Battery replacement is easy and doesn’t need surgery</td></tr>
<tr><td>v) Small in size</td><td>v) Large in size</td></tr>
<tr><td>vi) It requires an open surgery to place the generator</td><td>vi) It doesn’t requires an open surgery</td></tr>
<tr><td>vii)It is protected from external disturbances</td><td>vii) Not protected from external disturbances</td></tr>
</table></td><td>01 mark for each point</td><td></td></tr>
<tr><td>c</td><td colspan="2">Draw a neat and labeled diagram of heart.</td><td></td><td>04</td></tr>
</table>

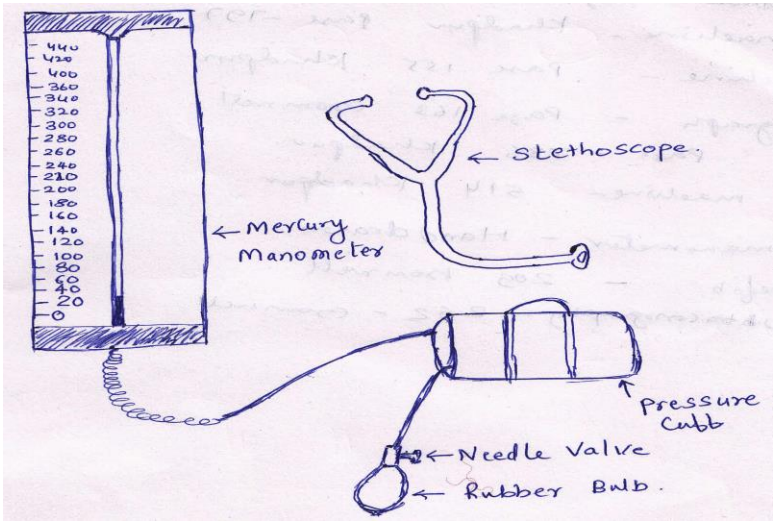
Ans	 OR 	04 marks for labeled diagram	
d	**Compare CT Scan's method of visualization with conventional X-ray method (any four points)**		**04**
Ans		01 mark for each point	

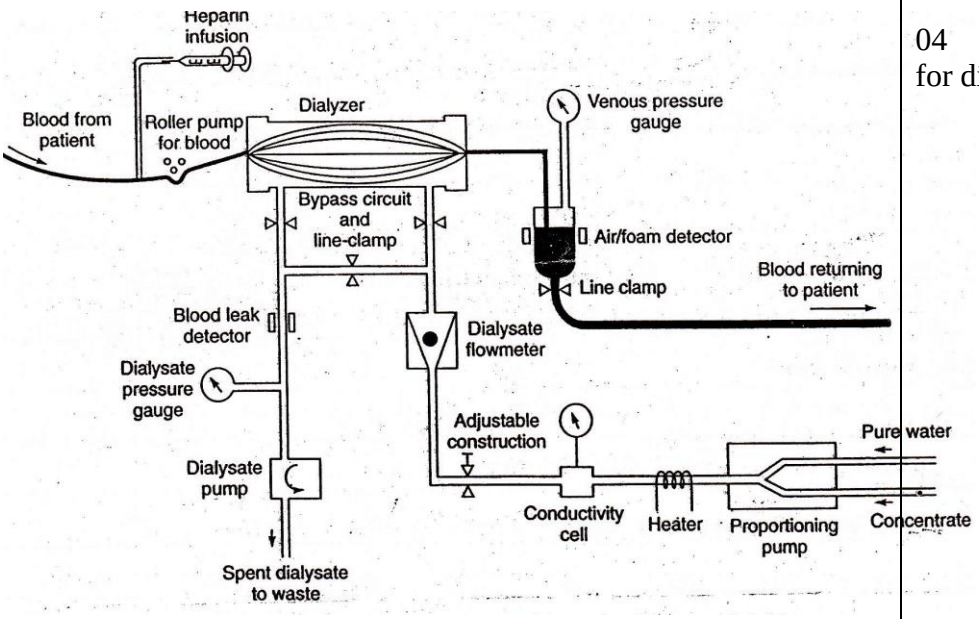
CT Scan	X-Ray machine
i)It is 3D imaging technique	It is 2D imaging technique
ii) Digital images of soft tissues, blood vessels can be seen on computer monitors by physician	X-Ray images shows dense bone structure only
iii)Pictures displayed are reconstructed from a large number of absorption profile taken at regular angular intervals around slice	Pictures displayed are photographs.
iv)In this detector array(Electronic device) absorbs the penetrated X-rays	In this, film directly absorbs penetrated X-rays

e	**Describe action potential with the help of neat and labeled diagram**		**04**

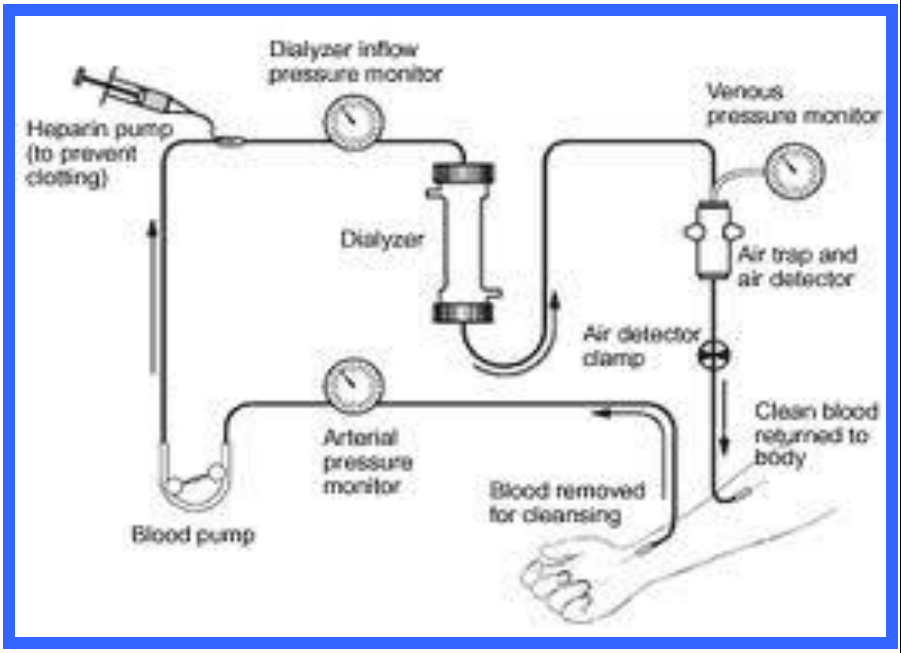
Ans	**Diagram of action potential :**  **Explanation:** When cell is excited by any external excitation or stimulus then property of cell membrane changes, which allows entry of Na+ ions. The large number of Na+ ions tries to enter inside the cell than the number of Cl- ions leaving the cell body. So after some time inside the cell body potential is more +ve than outside. This developed potential in the cell is called as "action potential". A decrease in resting membrane potential difference is called Depolarization. **OR** **Other relevant diagram and explanation should be considered**	02 marks for diagram 02 marks for explanation	
f	**Describe the instrument spirometer to measure respiration rate with neat and labeled diagram**		**04**
Ans	**Diagram of Spirometer :**	02 marks for diagram	

	 **OR any other relevant diagram** **Working of Spirometer :** Above figure shows the diagram for Spirometer. Spirometer is a device which is used to determine all lung volumes and capacities. The standard Spirometer consists of a movable bell inverted over a chamber of water. Inside the bell is the gas that is to be breathed. The bell is counterbalanced by a weight to maintain the gas inside the atmospheric pressure so that its height above the water is proportional to the amount of gas in the bell. A breathing tube connects the mouth of the patient to the Spirometer. Thus as the patient breathe gas from the tube there are changes in internal volume of Spirometer which causes proportional displacement of bell downwards. Similarly, as the patient breaths back into the tube, the bell moves up proportional to the change in internal volume. The motion is recorded on a rotating drum i.e. kymogram through a pen that is attached to a counter balancing mechanism.	02 marks for explanation	
Q.4	**Attempt any TWO of the following**		**16**
a	**Describe the indirect method of blood pressure measurement with the help of diagram. State the systolic and diastolic pressure range in a healthy human being**		**08**

Ans	**Diagram of measurement of blood pressure using sphygmomanometer:**  **OR any other relevant diagram** **Description :** • The familiar indirect method of measuring blood pressure involves use of Sphygmomanometer and a stethoscope. Sphygmomanometer consists of an inflatable pressure cuff and mercury manometer to measure the pressure in the cuff. • The cuff consists of a rubber bladder inside an inelastic fabric covering that can be wrapped around the upper arm and fastened with either hook or a Velcro fastener. The cuff is normally inflated manually with rubber bladder and deflated slowly through a needle valve. • The Sphygmomanometer works on the principle of that when the cuff is placed on the upper arm and inflated (filled with air pressure), arterial blood can flow past the cuff only when the arterial pressure exceeds the pressure in the cuff. • So first pressure in cuff is increased by inflating cuff with the help of rubber bladder pumping manually above systolic pressure at this point no sound is heard through the stethoscope which is placed over the brachial artery. For that artery has been collapse by the pressure of the cuff. • The pressure in the artery gradually reduced by opening needle vale slowly. • As soon as cuff pressure falls below systolic pressure, small amount of blood Spurt past the cuff and KOROTKOFF sounds begin to be heard through stethoscope.	02 marks for diagram 04 marks for explanation	

	• The pressure of the cuff that is indicated on MANOMETER when the first Korotkoff sound is heard is recorded as the systolic blood pressure. Standard range of systolic blood pressure in normal adult is in the range of 95-140 mm of Hg with 120 mm of Hg being average. • As the pressure in the cuff continues to drop the Korotkoff sound continue until cuff pressure is no longer sufficient to occlude the vessel. Below this pressure Korotkoff sound disappears marking the value of Diastolic Pressure. Standard range of diastolic blood pressure in normal adult is in the range of 60-90 mm of Hg with 80 mm of Hg being average. **Systolic blood pressure:** Range of systolic blood pressure in normal adult is in the range of 95-140 mm of Hg with 120 mm of Hg being average. **Diastolic blood pressure:** Range of Diastolic blood pressure in normal adult is in the range of 60-90 mm of Hg with 80 mm of Hg being average.	01 mark for each pressure range	
b	**Draw a block diagram of dialysis machine. Explain its working in detail**		**08**
Ans	**Block diagram of dialysis machine :**  	04 marks for diagram	

OR



Explanation :

Dialysis machine works as artificial kidney which has following parts,

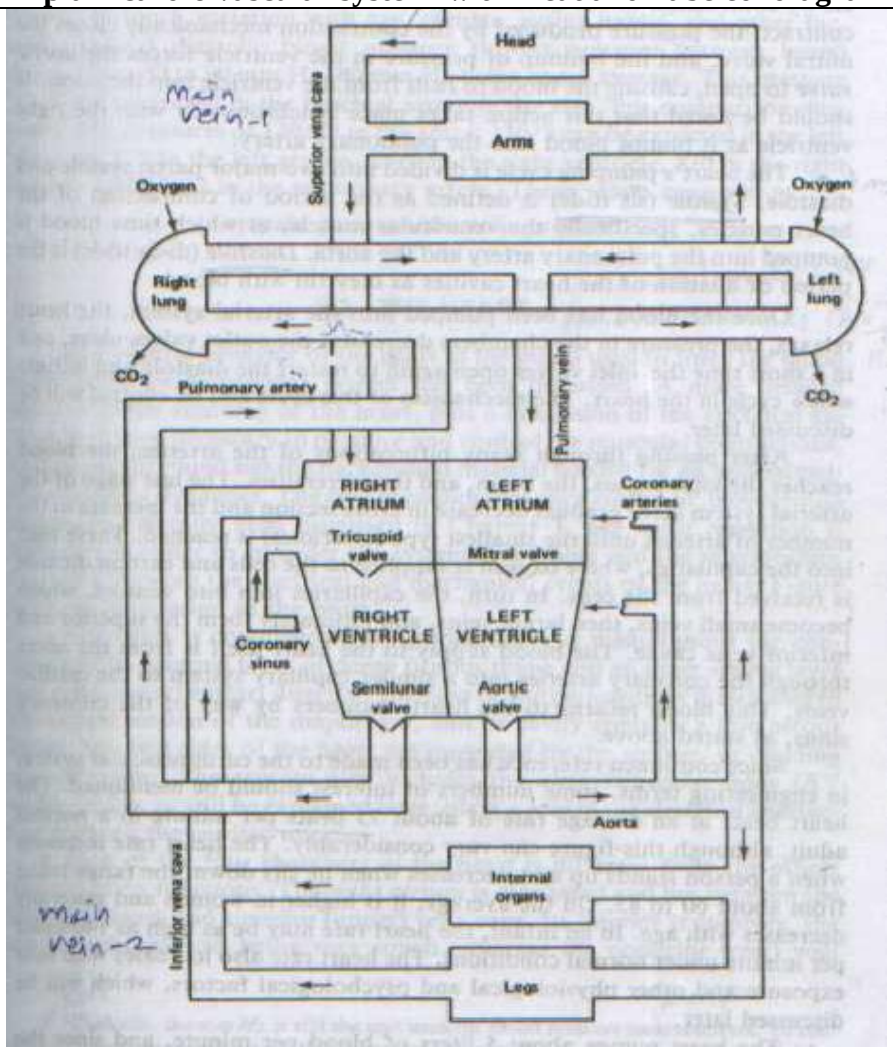
1. Dialyzer
   This is the part in which blood filtration actually takes place and urine is formed.

2. Proportionating Pump :
   It produces steady flow of quality dialysate by having proper proportion of water and concentrated chemical.

3. Dialysate temp Control :
   To achieve dialysis at body temperature the control of temperature is essential.

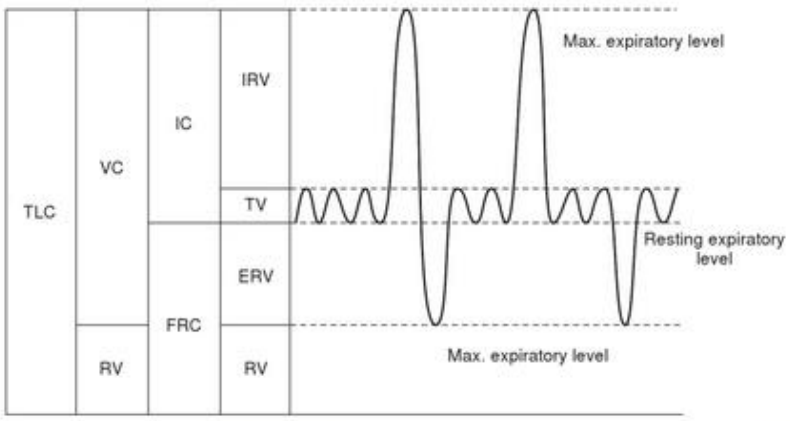
4. Heparin infusion
   It is done in order to avoid coagulation or clotting of blood, which is taken from the patient.

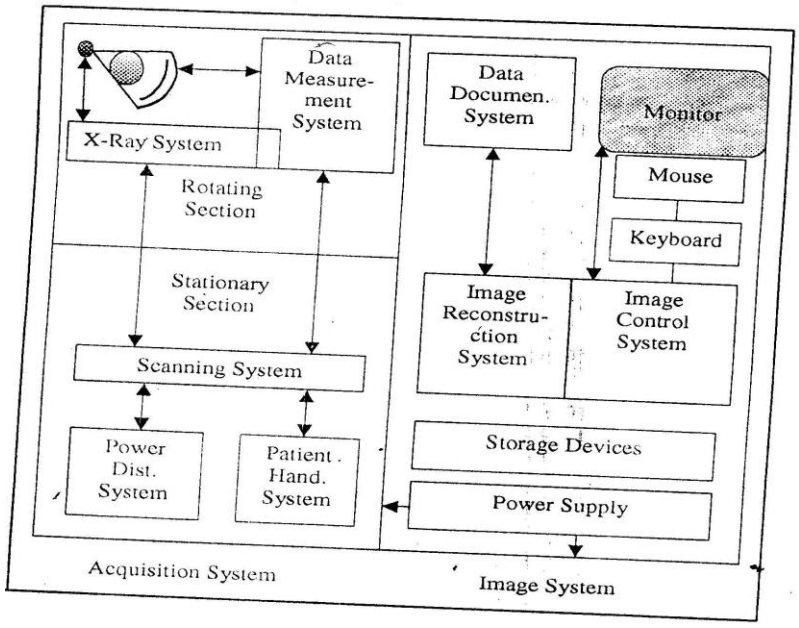
04 marks for explanation

	5. Venous pressure gauge : It monitors the pressure of blood which is given back to the patient. 6. Air/Foam Detector It detects the presence of air / Foam in the blood to avoid danger. 7. Blood leak detector : It detects the leakage of blood from the dialyzer 8. Bypass circuit and line in clamp : It is used to bypass the dialysate flow, for replacement, maintenance or repair of dialyzer.		
c	**Explain cardio vascular system with neat and labeled diagram**		**08**
Ans		04 marks for diagram	

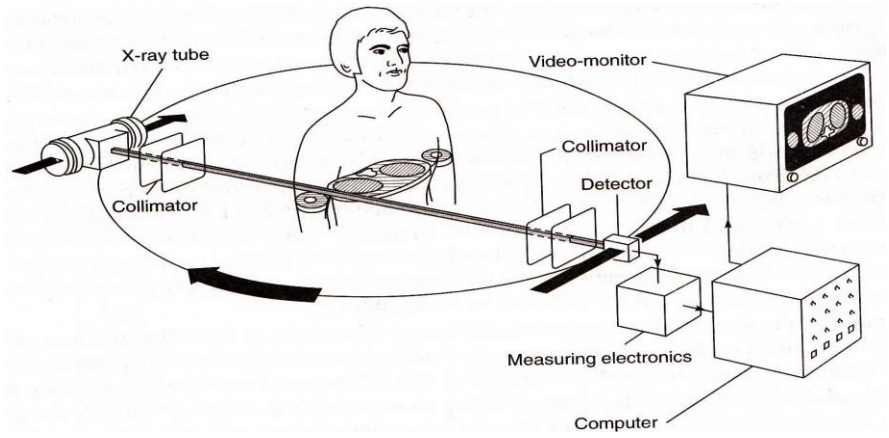
	Explanation: The system is closed complex hydraulic system which performs essential service of transportation of oxygen, CO2,and blood cells The heart is divided into four chambers: right atrium (RA) ,right ventricle (RV) ,left atrium (LA),left ventricle (LV) . All blood enters the right side of the heart through two veins: The **superior vena cava** (SVC) and the **inferior vena cava** (IVC). The SVC collects blood from the upper half of the body. The IVC collects blood from the lower half of the body. Blood leaves the SVC and the IVC and enters the **right atrium** (RA) When the RA contracts, the blood goes through the **tricuspid valve** and into the **right ventricle** (RV) . When the RV contracts, blood is pumped through the **pulmonary valve** , into the **pulmonary artery** (PA) and into the lungs where it picks up oxygen. Blood returning from the body is relatively poor in oxygen. It needs to be full of oxygen before being returned to the body. So the right side of the heart pumps blood to the lungs first to pick up oxygen before going to the left side of the heart where it is returned to the body full of oxygen. Blood now returns to the heart from the lungs by way of the **pulmonary veins** and goes into the **left atrium** . When the LA contracts, blood travels through the **mitral valve** and into the **left ventricle** . The LV is a very important chamber that pumps blood through the **aortic valve** and into the **aorta** . The aorta is the main artery of the body. It receives all the blood that the heart has pumped out and distributes it to the rest of the body. The LV has a thicker muscle than any other heart chamber because it must pump blood to the rest of the body against much higher pressure in the general circulation (blood pressure).	04 marks for explanation	
Q.5	**Attempt any TWO of the following**		**16**
a	**Describe lung volumes and capacities**		**08**
Ans	Measurement of lung volumes provides a tool for understanding normal function of the lungs as well as disease states. In normal breathing at rest, approximately one-tenth of the total lung capacity is used. The following terms are used to describe lung volumes.		

	Lung Volumes: (any FOUR) **Tidal Volume (TV):** The volume of gas inspired or expired (exchanged with each breath) during normal quiet breathing. OR The volume of air breathed in and out without conscious effort. **Minute Ventilation:** The volume of gas exchanged per minute during quiet breathing. MV=TV x Breathing rate **Alveolar Ventilation(AV):** the volume of fresh air entering the alveoli with each breath. Alveolar Ventilation=breathing rate X (Tidal volume-Dead space) **Inspiratory Reserve Volume (IRV):** The volume of gas which can be inspired from a normal end. OR The additional volume of air that can be inhaled with maximum effort after a normal inspiration. **Expiratory Reserve Volume (ERV):** The volume of gas remaining after a normal expiration less the volume remaining after a forced expiration. ERV=FRC-RV OR The additional volume of air that can be forcibly exhaled after normal exhalation **Residual Volume (RV):** The volume of air remaining in the lungs after maximum exhalation or forced expiration. **Lung Capacities: (any FOUR)** **Functional Residual Capacity:(FRC)** The volume of gas remaining in the lungs after normal expiration. **Tidal Lung Capacity:(TLC)** The volume of gas in the lungs at the point of maximum inspiration. TLC=VC+RV **Vital Capacity (VC):** The greatest volume of gas that can be inspired by voluntary effort	01 mark for each term of lung volume 01 mark for each term of lung capacity	

	after maximum expiration irrespective of time. OR The total volume of air that can be exhaled after a maximum inhalation: VC = TV + IRV + ERV **Inspiratory Capacity:** The maximum volume that can be inspired from the resting end expiratory position. **Dead Space:** It is the functional volume of the lung that doesn't participate in gas exchange. **Total Lung Capacity (TLC)**:TLC= VC + RV  ➤ Fig. *Volume and capacities of the lungs-standardization of definitions and symbols in respiratory physiology*		
b	**Explain with the help of neat and labeled diagram working of CAT scan.**		**08**
Ans	**Diagram of CAT scanner :**	04 marks for diagram	



OR

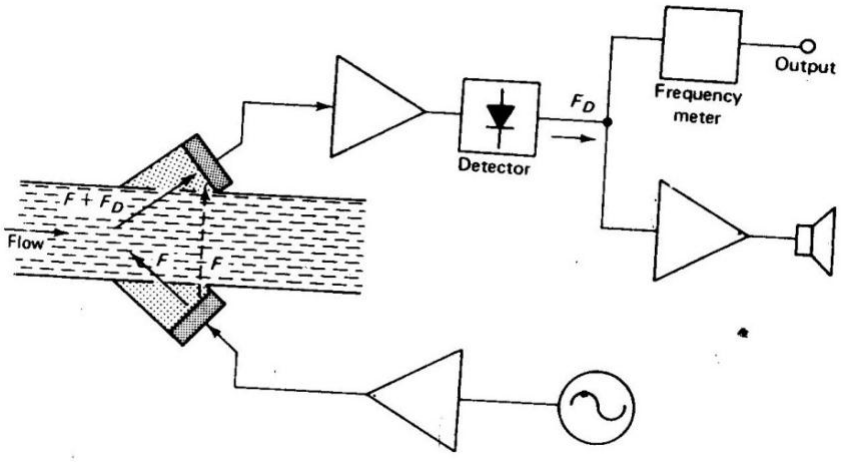


Working of CAT scanner :

The CT scanner consists of gantry, patient table. X ray tube, detector assembly, computer and monitor. X ray tube and detector assembly mounted opposite each other in a rigid gantry rotates once around the patient. The x ray tube emits the x rays at short intervals so that during a full rotation a number of sets of absorption values are collected by detectors. Computer process this data and produces images of the measured values.

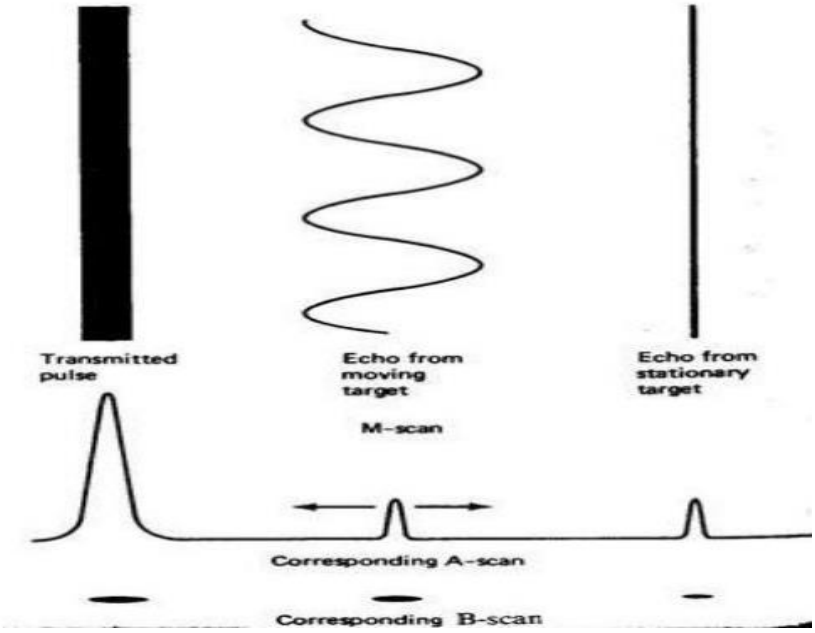
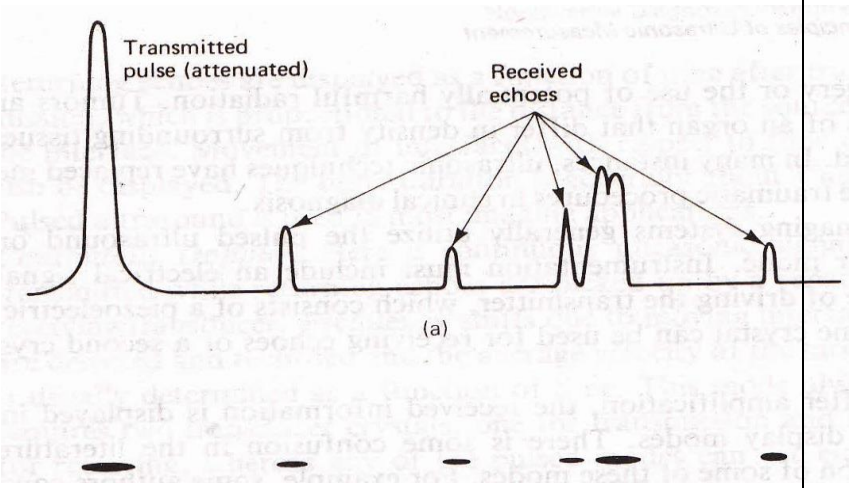
The image system controls the function of CT scan such as reconstruction, display and evaluates the CT image.The image

04 marks for working

	control system is connected to monitor, keyboard, mouse and various storage devices such as disks, tape etc.The image reconstruction system receives measure data and performs the image reconstruction on it. These images are processed and displayed. The data documentation system is connected to the image reconstruction system and is used to photograph the reconstructed CT image. Acquisition system acquires the data. The data measurement system belongs to the rotating part of the gantry and contains all the elements to measure the attenuated radiation and to transfer this to image system for reconstruction and display of CT image. X ray system also belongs to the rotating part of gantry. The scanning system contains the function of gantry rotation, gantry tilt, to exchange data with X ray system and data measurement. The patient handling system consists of patient table, motor for vertical and horizontal drive and system controller. The power distribution system provides power supply to all the various systems shown in figure.		
c	**Draw and explain ultrasonic type blood flow measurement.**		**08**
Ans	**Diagram of Ultrasonic Blood Flow Meter based on Doppler shift :**  **Working of ultrasonic blood flow meter :** Ultrasonic blood flow meter works on two principle 1. Transit type ultrasonic flow meter 2. Doppler shift type ultrasonic blood flow meter. In an ultrasonic blood flow meter a beam of ultrasonic energy is used to measure the velocity of flowing blood. A pulsed beam is directed through the blood vessel at a shallow angle and its transit time is measured. The transit time is proportional to the velocity of blood flow. An oscillator, operating at a frequency of several megahertz, excites a piezoelectric transducer. This	04 marks for diagram 04 marks for working	

	transducer is coupled to the wall of an exposed blood vessel and sends an ultrasonic beam with a frequency F into the flowing blood. A small part of the transmitted energy is scattered back and is received by a second transducer arranged opposite the first one. Because of the scattering, due to moving blood cells the received frequency is either F+Fd or F – Fd depending on direction of flow. The Doppler frequency component (Fd) is proportional to velocity of blood. **Note:** **any equivalent diagram based on transit time with explanation should be considered**		
Q.6	**Attempt any FOUR of the following**		**16**
a	**Explain the terms Microshock and Macroshock. How it can be avoided?**		**04**
Ans	**Microshock & Macroshock:** Electrical accidents are caused by the interaction of electric current with the tissues of the body. For an accident to occur, current of sufficient magnitude must flow through the body in such a way that it impairs the functioning of vital organ. The physiological effects of the current depends not only on their magnitude but also on the current pathway through the body, which in turn depends on the location of the two contacts. **Microshock:** When an interaction of electric current takes place with human body or human body tissues in such a way that one contact is applied directly to the heart & other to body surface, the effect of current applied to the heart is often referred to as microshock. **Macroshock:** When an interaction of electric current takes place with human body or human body tissues in such a way that current applied to the surface contacts, the effect of current applied to the heart is called as macroshock. **It can be avoided by following precautions: (any two)** 1. Knowledge of equipments that may cause microshock or macroshock. 2. Earthing all monitoring equipments for medical standard. Also frequently monitoring the earth resistance. 3. Maintaining minimum environmental standards. 4. Proper shielding of instruments an cables or providing double insulation. 5. Use of electrical equipments that are certified to reduce risk of microshock or macroshock. It uses high impedance leads which reduces inducible currents.	01 mark for each term 01 mark for each	

	6. Avoid coiling of any patient connected cables or tubing.		
b	**State the importance of paddle electrodes. Also list two specification of DC fibrillator.**		**04**
Ans	**Importance of Paddle Electrodes: (any two)** • In Defibrillation pulses of large current has been applied to the patient. To proper deliver of large current discharge applied through the skin, large electrodes are required. • These are available for external as well as internal use. • To protect the person applying the electrodes from accidental electric shock, special insulated handles are provided. Also a thumb switch is provided inside the paddles to discharge the defibrillator when paddles are properly positioned. • This prevents the patient or someone else, from receiving a shock prematurely. • Paddles are reusable. • Modern paddle electrodes allow for monitoring. **Specifications of DC Fibrillator: (any two)** • Type of electrodes: Paddle elctrodes • Operating mode: semi automatic. • Waveform: e ~ cube Biphasic (BTE type). • Energy: 150 J into a 50Ω load (default setting). • Pre-programmed selection (150 J-150 J- 150 J, 150 J-150 J-180 J, 150 J-180 J- 180 J). • Charging time: Less than 10 seconds. • Sensitivity & Specificity: Meets AAMI guidelines. • Detection Level: > 0.1 mV ECG. Defibrillation Electrodes: multifunctional electrodes (disposable) adult adhesive pads (pre-gelled)	01 mark for each 01 mark for each	
c	**Explain A and B mode of Ultrasonography with the help of waveforms.**		**04**

Ans	**Diagram:**  **OR**  	02 mark for diagram	

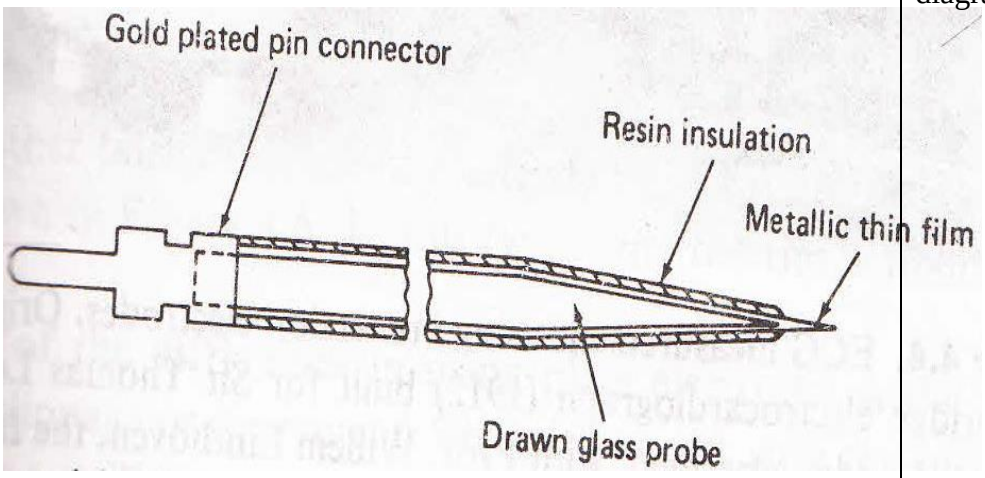
	A scan: This mode is the simplest among other methods. The transmitted signals and echo signals are applied to the Y plates of CRT so that they are displayed as vertical deflections on the CRT screen. The vertical sweep is calibrated in units of distance and provides vertical deflections in various ranges depending upon the distance of the interface. Echoencephalogram is typical example of A scan display. **B scan:** If A scan echoes are rotated electronically 90^0 towards the viewer, the echoes can be viewed along the horizontal axis as bright and dim dots. The distance between the bright and dim dots represents the depth of tissues and the brightness of the dots represents the strength of the echoes. These dots can be used to obtain a pictorial display of internal organs if position of the probe is continuously moved and the corresponding echoes are obtained.	02 mark for diagram	
d	**State any two needs of dialysis machine. Also state any two specifications of the same.**		**04**
Ans	**Need of Dialysis machine: (any two)** There is need When the original kidney of patient is • Unable to form urine • Unable to removal of waste products from blood plasma • Unable for the regulation of the composition of blood plasma • Unable to regulates volume , osmotic pressure in the blood vessels , • Unable to Balance Ph and electrolyte composition of the body fluids **Specification: (any two)** **Specifications:** 1. Input power plug- 120V input 2. Time delay fuse on ckt breaker 3. 120L dialysate holding tank 4. Temperature 250C to 500C (370C is body temp) 5. Over temperature shutoff and alarm 6. Positive and negative pressure monitor micro switch.	01 mark for need 01 mark each	

e	**State four functions of kidney.**		**04**
Ans	Main function of kidney is to form urine out of blood plasma. It consists of two processes i) To form urine out of blood plasma. ii) removal of waste product and iii) Regulation of composition of blood plasma. iv) To maintain osmotic pressure v) PH & electrolyte composition of extra cellular blood fluids	01 mark for each	
f	**Describe with neat and labeled diagram:** **i) Needle electrode ii) Micro electrode**		**04**
Ans	**1. Needle electrode :**  To reduce interface impedance and consequently, movement artifacts, small sub dermal needles are inserted into the skin. The basic needle electrode consists of a solid needle, usually made up of stainless steel, with sharp point. The repairing part of the needle electrode is insulated with a coating such as insulating varnish, with only the tip left exposed. A lead wire is attached to the other end of the needle and the joint is encapsulated in a plastic hub to protect it. Needle electrodes that can create an interface beneath the surface of the skin seem to be less susceptible to movement artifacts then surface electrode. By making direct contact with the sub dermal tissue on intercellular fluids, these electrodes also seem to have lower impedances.	01 mark for diagram 01 mark for explanation	

ii) Micro Electrode :

Diagram :

01 mark for diagram



Explanation of Micro Electrode :

01 mark for explanation

Micro Electrode is used to measure bioelectric potentials near or within a single cell. In this a metal needle is prepared in such a way as to produce a very fine tip. This metal needle is supported by large metallic insulated shaft.