



Winter– 15 EXAMINATION

Subject Code:17672

Model AnswerPage No: 01__ / 26

Important Instructions to examiners:

- 1) The answers should be examined by key words 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.



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Q. 1 (a) Attempt any THREE of following.12

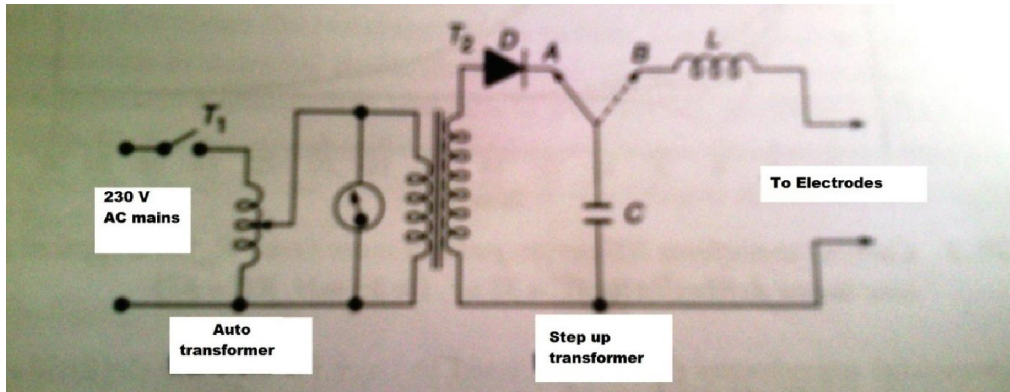
(i) List any four technical specifications of Pacemaker. 4

Ans : any 4 points for 4 marks

- 1) Output voltage 0-15v
- 2) Output current 1-12 mA
- 3) Maximum sensitivity 1.5 mv
- 4) Battery material lithium
- 5) Pulse width 2-3ms

(ii) Draw a circuit diagram of dc defibrillator and also state the need of defibrillator. 4

Ans :



2 marks

Fig :Circuit diagram of dc defibrillator

Need of dc defibrillator :

Ventricular fibrillation can be converted into a more efficient rhythm by applying a high energy shock to the heart. This sudden surge across the heart causes all muscle fibres to contract simultaneously. Possibly, the fibres may then respond to normal physiological pacemaking pulses. The instrument for administering the shock is called a defibrillator.



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The shock can be delivered to the heart by means of electrodes placed on the chest patient (external defibrillator) or the electrodes may be held directly against the heart when the chest is open (internal defibrillator). Higher voltages are required for external defibrillation than for internal defibrillation.

2 marks

(iii) State the troubleshooting procedural steps of ventilator. 4

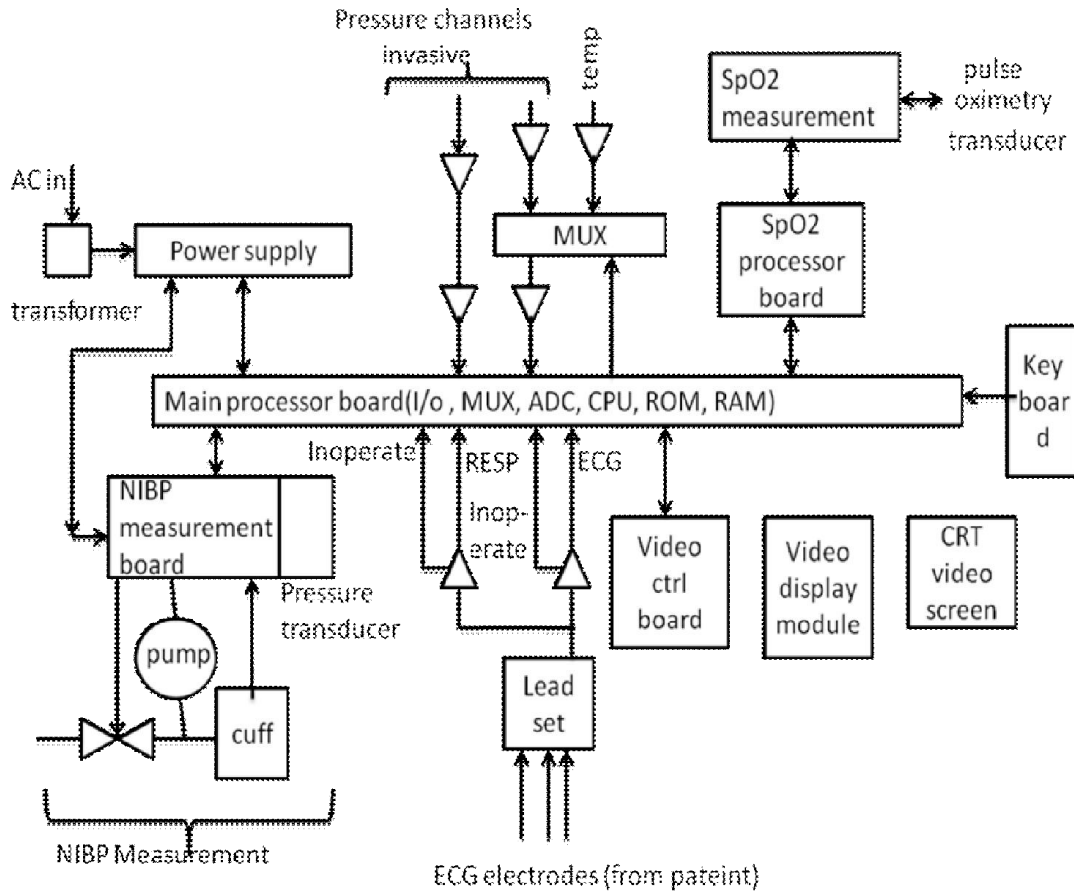
Ans : 4 points for 4 marks

- 1) Check shutter & filter calibration.
- 2) Check battery & maintain cover.
- 3) Update software periodically.
- 4) Check TV camera connections.



iv) Draw a block diagram of bedside monitor and state its two advantages.

4



2 marks

Fig : Block diagram of bedside monitor

Advantages : (any 2 for 2 marks)

-Easy to review the necessary information :

Various parameter modules and units, from basic parameters to multi-gas and Flow/Paw. Also you can review the data from external units on the same screen. Dual displays provide different sets of information for the surgeon and anesthesiologist.

- High performance for intensive monitoring and easy operation for medical care staff :

Enhanced ECG monitoring and variety of review displays for intensive care. Flexible components and easy operation by touch screen, mouse, keyboard and remote controller.



- User Friendly Interface : You can operate the monitor by touch screen, keyboard, mouse or remote controller.

- Effective Alarm System : The alarm indicator on top of the monitor can be clearly seen at a distance. The alarm indicator is also synchronized with heart rate, blood pressure or SpO₂. 2

b) Attempt any ONE of following. 6

(i) State the difference between ac and dc defibrillator. Draw a simple circuit diagram for charging of dc defibrillator. 6

Ans :-Difference between ac & dc defibrillator: (any 2 points of each 1 marks for each point)

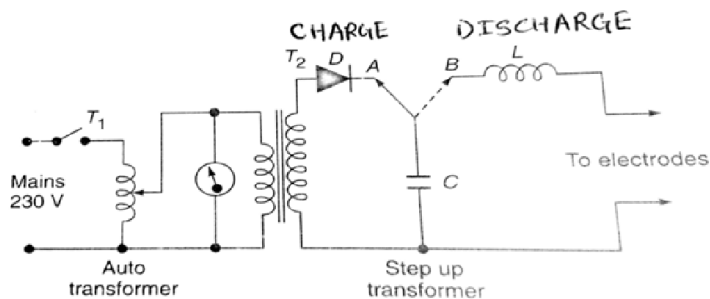
AC defibrillator:

A defibrillation by applying a brief (0.25 -1 sec) burst pulse of 60 hertz at an intensity of around 6 amp to the chest of patient through appropriate electrodes . This application of an electrical shock to re-synchronises the heart is some times called counter shock. It is not used for atrial defibrillation. This is known as instant mode of defibrillation

DC defibrillator:

DC defibrillator is used to restore the synchronized working of the heart with the pacemaker of the body. For termination of ventricular tachycardia atrial fibrillation & other arrhythmias it is essential to use a defibrillator with synchronizer circuit. Defibrillation must take place during that period this is called cardio version. In this technique the ECG of the patient is fed to the defibrillator & the shock is given automatically at right instant. This is called capacitive discharge delay line or Dc defibrillator with synchronizer mode defibrillator.

Circuit diagram for charging of dc defibrillator : 2 marks



► Fig. 26.2 Schematic diagram of a defibrillator



(ii) State the types of dialyzers. Draw a block diagram and explain the working principle of haemodialyzer machine.

6

- Types of dialyzers :
- 1) Parallel Flow Dialyzers
 - 2) Coil Dialyzers
 - 3) Hollow Fiber Hemodialyzer.
- Any 2 types for 2 marks

Block diagram haemodialyzer machine : 2 marks

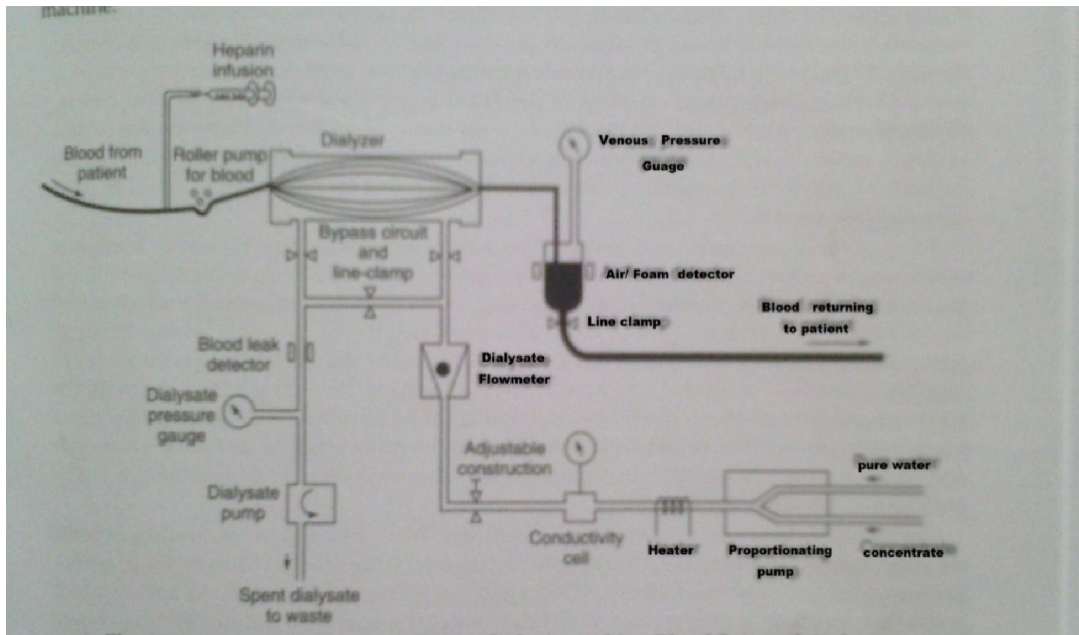


Fig : Block diagram of haemodialyzer machine.

Working principle of artificial kidney (Hemodialysis machine): 2 marks

Haemodialysis machine is used to purify the blood in case if kidney is partially or completely not working. Proportionating pump prepare the dialysate solution by using dry chemicals and water with the ratio of 1:35 respectively. The Haemodilysis procedure is done at the room temperature. The heater is used to maintain the temperature of the dialysate. The rate of filtration depends upon the concentration in the dialysate. To measure the concentration in the dialysate a conductivity cell is placed at the path of the dialysate before it reaches to the dialyzer.



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Dialyzer is an artificial kidney. It is actual site where the filtration takes place. Depending upon the construction of the dialyzer the blood and dialyzer are made to come in contact to each other through a semipermeable membrane. The impurities in the blood are sucked out through this semipermeable membrane in to the dialysate.

During the process of dialysis two more detectors are used.

- 1) Blood leak detector: it is used to detect if there are any leakage in the blood tubing or blood path. If detected any leakage then the blood is bypassed to the body.
- 2) Air Bubble Detector: during the whole procedure if some air bubble found in the blood tubing it must be removed before it reaches to heart. Because air bubble in the blood circulation can cause serious problems. This detector uses photoelectric method. If some air found in the path the blood is bypassed to the body.

Heparin is added to the blood to avoid the blood clotting.

Q. 2) Attempt any FOUR of following.

16

(a) State the types of pacemakers and explain the difference between internal and external pacemaker. (any two points of difference)

4

There are two types of pacemaker:

- 1) External pacemaker
- 2) Internal pacemaker

Difference between internal and external pacemaker : any 2 points for 2 marks

External	Internal
1) External pacemaker is used for those patients who has temporary heart irregularities	1) Internal pacemaker is used for patient whose SA node have permanently fail.
2) Electrodes placed on the surface of body	2) Leads are directly connected to heart muscle.
3) Output current is 80 mA	3) Output current is 5 mA



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4) External pacemaker consist of an externally worn pulse generator connected to electrodes located on or within myocardium.	4) Internal pacemaker consist of entire system inside the body.
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(b) List any four technical specifications of the baby incubator.

4

Ans : any 4 for 4 marks

- 1) Recommended environment for operation 24 Oc – 30 Oc
- 2) Baby bed size 550* 390 mm
- 3) Heater wattage 250 watts
- 4) Electrical 230v AC 50 Hz
- 5) Weight 45 kgsApprox

(c) Explain the different modes of ventilator.4

Ans :

Modes of ventilator.(any 2 modes 2 marks each)

i) Controller:

A ventilator which operates independent of the patient's inspiratory effort. The inspiration is initiated by a mechanism which is controlled with respect to time, pressure or another similar factor. Controlled ventilation is required for patients who are unable to breath on their own.

ii) Assistor:

A ventilator which augments the inspiration of the patient's inspiratory effort. A pressure sensor detects the slight negative pressure that occurs each time the patient attempts to inhale and triggers the process of inflating the lungs. Thus the ventilator helps the patient to inspire when needed. A sensitivity adjustment provided on the equipment helps to select the amount of effort required on the patient's part to trigger the inspiration process. The assist mode is required for those patients who are able to breathe but are unable to inhale a sufficient amount of air or for whom breathing requires a great deal of effort.

iii) Assistor\Controller:

A ventilator which combines both the controller and assistor functions. In these devices, if the patient fails to breathe within a pre-determined time, a timer automatically triggers inspiration process to inflate the lungs. Therefore, the breathing is controlled by the patient as long as it is



possible, but in case the patient should fail to do so, the machine is able to take over the function. Such devices are most frequently used in critical care units.

(d) Explain the concept of Infusion pump and Balloon pump.

4

Ans :

Infusion pump: 2 marks

In many medical applications intra-venous (IV) fluids & drugs need to be infused over a period of time which could be several minutes , hours, & days . The most common method of doing this is by manual injection of bolus doses using syringes by manually setting the drip rate of gravity feed intra-venous infusion sets. The volumetric infusion pump is generally used to deliver larger volumes of fluid from a bag or bottle. This pump technology evolved from the desire to improve on the flow rate control provided by the simple mechanical roller clamp . The first improvement was the electronic drop counter that could quickly determine the drip rate of IV delivery. Soon there after came a device which could control the drop rate automatically. Control of secondary medications , variable delivery patterns , dose rate calculations & even in-line mixing of medications are other refinements resulting from the changing requirements of new drug therapies.

Balloon pump: 2marks

The balloon pump save your breath &energy . This balloon pump gives you the lungpower to inflate latex balloons at record pace. The balloon pump looks & operates like a standard bicycle pump , except for the specially designed needle nozzle that grips the balloon by the neck. Slide the balloon onto the nozzle , pump it up , remove, & tie. Then repeat process again &again , if you bought the 100 count bag of assorted balloons. For ages 3 &up.

Balloon pump product details:

- Works like a bicycle pump.
- Needle nozzle for easy fills.
- Plastic case , metal pump rod.

(e) Draw block diagram of heart lung bypass machine and explain its working.

4

Ans : block dia 2 marks explanation 2 marks

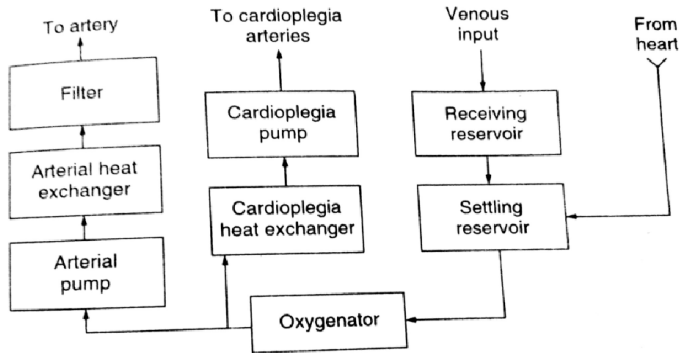


Figure 10.28 Heart lung machine (cardiopulmonary bypass).

During open heart surgery for installation of a valve prosthesis or correction of a congenital malformation the heart can not maintain the circulation. It is then necessary to provide extra-corporeal circulation with a special machine called heart lung machine..

WORKING.

Usually two cannulas are inserted in to the right side of the heart to collect the returning venous blood as shown in fig.Using heart lung machine extracorporeal circulation can be possible and in which the lungs and heart are replaced by the **OXIGENERATOR** and **BLOOD PUMP** respectively.

The collected venous blood is directed in to a receiving reservoir of heart lung machine by gravity drainage.

The accumulated blood in the operating field is also collected and passed in to the receiving reservoir by suction devices. From here the blood is passed in to the setting reservoir or dabbling chamber and then it is passed in to oxygenator. In the oxygenator the blood is exposed to an atmosphere rich in oxygen.

From oxygenator a pump raises the pressure of the blood to the mean arterial pressure from which it flows in to an arterial heat exchanger. arterial heat exchanger. Is necessary during hypothermic or low temperature operation which is followed for two reasons the first is to reduce body metabolism and therefore to reduce oxygen consumption during the operation. And secondly the brain damage due to oxygen starvation is reduced.

In the heat exchanger the blood is maintained at the human body temperature.

From the heat exchanger the blood passes through a filter to prevent the possibility of partials or bubbles returning to the body.

Systematic circulation is maintained by returning the this arterial oxygenated blood to a major artery.

(f) State the importance of :

4

(i) Endocardial

(ii) Myocardial

(iii) Unipolar and bipolar leads.



Ans :

(i) **Endocardial** : This is connected to inner side of heart chamber and used in external pacemaker. The endocardial lead is inserted into the inside of the heart via a vein, usually in the chest area. Example : Porous tip electrode

(ii) **Myocardial** : This is connected to outer wall of heart muscle and used in internal pacemaker. This type of lead is most often used when other cardiac surgery is being performed and there is already access to the heart. Example: Steroid eluting electrode.

(iii) **Unipolar and bipolar leads** :

In unipolar system one electrode is inside or on the heart & is the stimulating electrode, & the second electrode is usually a large metal plate attached to the pulse generator. The current in this case flows between the pacing electrode in the heart & the indifferent electrode via the body tissue.

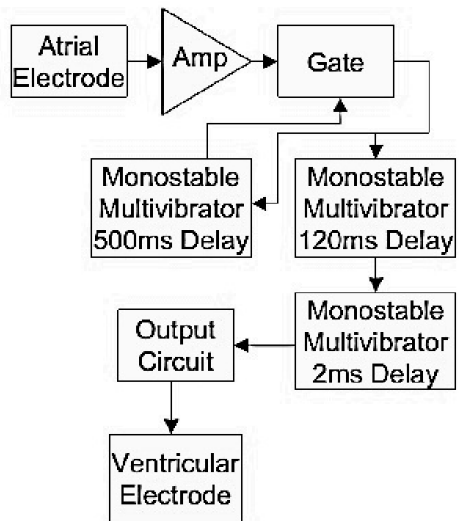
Bipolar leads which have two electrodes positioned in the heart are designed with a coaxial connector requiring only a single receptacle resulting in improvement in the size of bipolar pacemaker connector. In the bipolar electrode system both electrodes are approximately of the same size and both are placed inside or on the heart so that current flows between the two electrodes.

Q.3) Attempt any FOUR of the following.

(16)

a) Draw a block diagram of synchronous pacemaker and state the function of each block. 4

Ans : BD for 2 marks functions 2 marks



OR

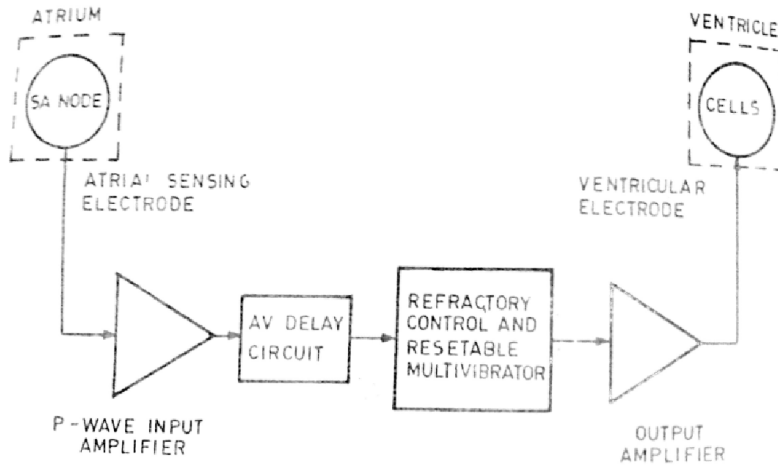


Fig : Block diagram of synchronous pacemaker

As SA node fires, it triggers the pacemaker. Gate is used to trigger the circuit and amplifier for amplification purpose.

Delays are used to simulate natural delay from SA to AV node (120ms) and to create a refractory period (500ms).

Output circuit controls ventricular contraction. 2ms delay is given to the output circuit.

Combining the demand pacemaker with this design allows the device to let natural SA node firing to control the cardiac activity.

b) Draw a block diagram of cardioverter & state the function of each block.

4

Ans: BD for 2 marks functions 2 marks

-Function of each block :

A block diagram of such defibrillator which is known as a cardioverter . Basically the device is a combination of the cardiac monitor & the defibrillator . ECG electrodes are placed on the patient in the location that provides the highest R wave with respect to the T wave. The signal from these electrodes passes through a switch that is normally closed connecting the electrodes to an appropriate amplifier . The output of the amplifier is displayed on a cardioscope so that the operator can observe the patients

ECG to see among other things whether the cardioversion was successful or in extreme cases whether it produced more serious arrhythmias. The output from the amplifier is also filtered & passed through a



threshold detector that detects the R wave . This activates a delay circuit that delays the signal by 30 ms & then activates a trigger circuit that opens the switch connecting the ECG electrodes to the amplifier to protect the amplifier from the ensuing defibrillation pulse. At the same time it closes a switch that discharges the defibrillator capacitor through the defibrillator electrodes to the patient.

Block diagram of cardioverter :

Block diagram of cardioverter :-

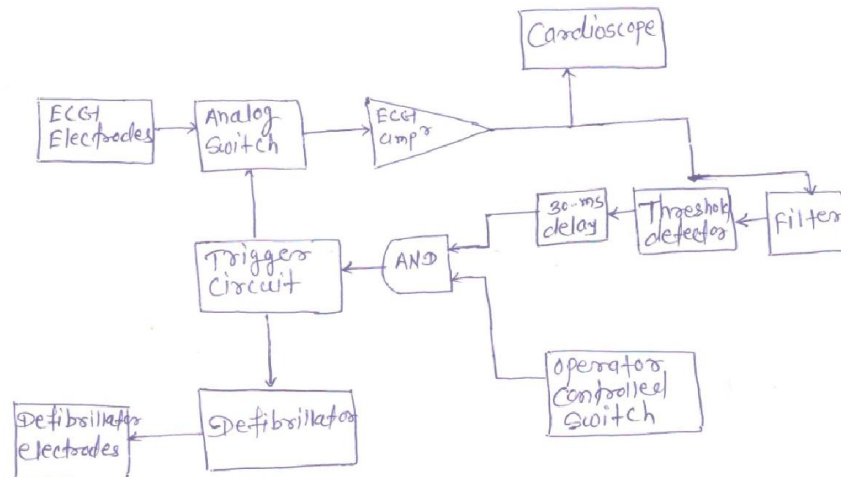


Fig:- A Cardioverter

c) State the need of :

4

(i) Nebulizer

(ii) Suction apparatus

(iii) Anaesthesia apparatus

(iv) Respirator

Ans :

Need of :

i) Nebulizer : Nebulizer is an instrument which is used in drug delivery. When therapy requires that water or some types of medications be suspended in the air as an aerosol, a device called nebulizer is used. In this device water or medication is picked up by a high velocity jet of oxygen or some other gas and thrown against one or more baffles or other surface.



(ii) **Suction apparatus** :The main function of this device to remove liquids and gases (such as vomiting, saliva) from mouth and respiratory tract, and also during surgeries to remove fluid from operated area.

(iii) **Anaesthesia apparatus** : A surgical method of treatment consists mainly of operations which are normally carried out under some form of anaesthesia.

So anaesthesia ensures that the patient does not feel pain and minimizes patient discomfort. It provides the surgeon with favorable conditions for the work.

(iv) **Respirator** :Respirator is device which helps in the respiration. In some cases when patient fails to initiate this process, or unable to perform its own respiration, respirator is used which triggers and/or helps in complete respiratory cycle of the patient.

d) State the condition in which central monitor is used. Describe it with neat diagram.

4

Ans :

condition 1 mks,

dia 2 mks,

explain 1mks

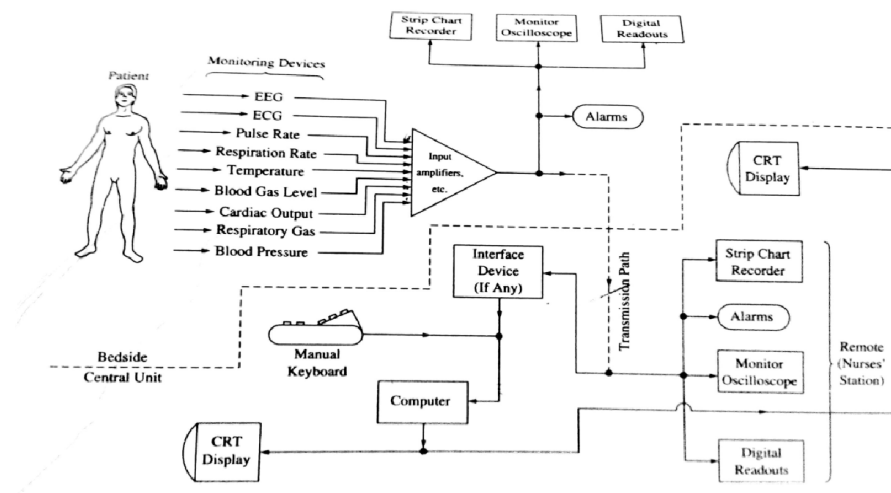


Fig : Block diagram of central monitor.

central monitor is used in following condition :

Central monitoring is the process of acquiring & recording the physiological parameter of different patients simultaneously on a single monitor at central station. In ICU the no. of critical patient is always high monitoring the physiological parameter for each patient is done by using bedside monitor but in some cases to reduce the manpower require delivering care.



e) Discuss the need of artificial kidney.

4

-It is also known as dialysis machine (dialyzer).

-It is used to partially or completely replace the functions of the kidney.

-When patient natural kidney fails to purify the blood by sucking out the toxic substances from it and eventually drained it, dialysis or artificial kidney is used.

- 1) It is used to purify the blood when natural kidney fails to do so.
- 2) It is used to support the filtration.

Q.4) a) Attempt any THREE of the following.

12

(i) Give application area of the following electrodes.

4

(1) Endocardial leads

(2) Myocardial leads

(3) Unipolar leads

(4) Bipolar leads

Ans : (1) Endocardial leads : This is connected to inner side of heart chamber and used in external pacemaker.. The endocardial lead is inserted into the inside of the heart via a vein, usually in the chest area.
Example : Porous tip electrode

(2) Myocardial leads : This is connected to outer wall of heart muscle and used in internal pacemaker. This type of lead is most often used when other cardiac surgery is being performed and there is already access to the heart. Example: Steroid eluting electrode.

(3) Unipolar leads : In uniplar system one electrode in inside or on the heart & is the stimulating electrode ,& the second electrode is usually a large metal plate attached to the pulse generator. The current in this case flows between the pacing electrode in the heart & the indifferent electrode via the body tissue.

(4) Bipolar leads : Bipolar leads which have two electrodes positioned in the heart are designed with a coaxial connector requiring only a single receptacle resulting in improvement in the size of bipolar pacemaker connector. In the bipolar electrode system both electrodes are approximately of the same size and both are placed inside or on the heart so that current flows between the two electrodes.

(ii) State the concept of respiration and apnoea.

4

Ans : respiration 2 marks apnoea 2 marks

Respiration – Respirator is device which helps in the respiration. To initiate the procedure of respiration certain amount of force is required by the body to move the chest upward and in front during inspiration while backward and downward during expiration. This creates the partial pressure difference between the



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atmosphere and the body which helps the air to go in and out, thus carried respiration. In some cases when patient fails to initiate this process, or unable to perform its own respiration, respirator is used which triggers and/or helps in complete respiratory cycle of the patient.

Apnea – Apnea is the cessation of breathing which may precede the arrest of the heart and circulation in several clinical situations such as head injury, drug over dose, anesthetic complication and obstructive respiratory diseases.

(iii) State the causes of the following faults of bedside monitor.

4

(1) ECG wave not displayed properly.

(2) Pulse not displayed.

(3) Temperature varies frequently

(4) Blood pressure not displayed.

Ans : 1 mark for each

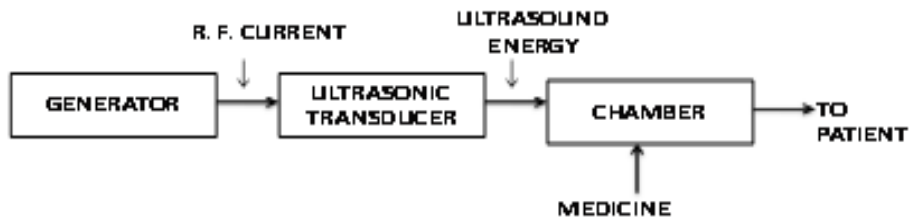
Fault	Causes
ECG wave not displayed properly.	1.Improper electrode connection with patient or problem with the ECG cable. 2. Patient movement
Pulse not displayed	1. Probe is not mounted correctly. 2.Probe not able to read through Dirt, nail polish, etc. 3. Patient movement. 4.Internal malfunction
Temperature varies frequently	1.Temperature probe and Sensor not working. 2. Patient movement
Blood pressure not displayed	1. Check sensor, pump and controller. 2. Patient movement



(iv) Draw a labeled block diagram of Nebulizer and state the function of each block.

4

Dia 2 mks functions 2mks



Nebulizer is an instrument which is used in drug delivery. When therapy requires that water or some types of medications be suspended in the air as an aerosol, a device called nebulizer is used. In this device water or medication is picked up by a high velocity jet of oxygen or some other gas and thrown against one or more baffles or other surface. To brake the substance into controllable sized droplates or particles which are then applied to the patients via respirator.

b) Attempt any ONE of the following.

6

(i) State the troubleshooting procedural steps of defibrillator any six points 1 mark each

1)For testing of the defibrillator we have to deliver the energy across the mass, so we can use a wet napkin which should be kept in between two paddles.

2)Then select a minimum energy using joule selector say 20 J.

3)Press the charge button and see that joules display will show the selected energy i.e. 20 J

4)Use the paddles and press discharge button on the paddles at the time such that the energy is deliver across a wet napkin. When we remove the pad from napkin it might be warm or burn.

5)There is rascality of internal in dummy load, charge the capacitor to minimum joules say 5 J and then press discharge button to deliver the energy across internal dummy load.

6)The joule display will shoe zero, releasing the capacitor discharged across the dummy load.

7)There is facility of automatic discharge after 45 sec of charging. We can see this by charging the capacitor to minimum joules say 5 J

8)Wait for 45 sec and see display which abruptly goes zero, releasing that capacitor is discharge internally.



(ii) State the need of :

6

- (1) Oxygenator
- (2) Artificial heart pump
- (3) Heat exchanger

And draw block diagram of Haemodialysis machine.

Ans :

Need of : 1 marks for each

(1) **Oxygenator** :Oxygenator is a device that is capable of exchange in oxygen and carbon dioxide in the blood of human body during surgical procedure.The oxygenators repeatedly draw of the blood from the veins, reoxygenates and pumps it into the arterial system. The oxygenator serves as the lung during the open heart surgery as the lung.

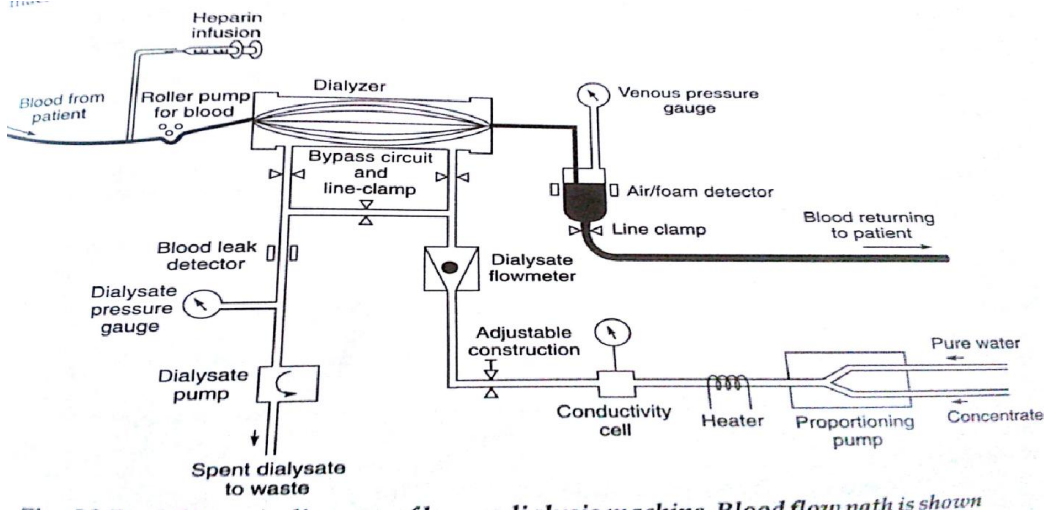
(2) **Artificial heart pump** :

This type of mechanism is called a peristaltic pump . The blood to and from the patients body is carried in a length of sterile clear plastic tubing called a cannula. Cannula with appropriate fitting to accommodate are inserted into the vessels to take blood from & deliver blood to the patient. Pumping action occurs because of the rollers on the rotating arm compresses the tubing carrying the blood forcing the blood ahead of the compressed section. This peristaltic action produces a wave like pulsatile flow of blood through the tubing.

(3) **Heat exchanger** :

It consist of water coils , isolated from but thermally coupled to the blood . A temperature control per minutes the pump operator to keep the blood at a proper temperature & compensates for the heat loss through radiation from the lungs.

Block diagram of Haemodialysismachine : 3 marks



Q5. Attempt any FOUR of the following:

16

a) State and explain the need of cardiac pacemaker

4

Ans:-

SA node is a natural pacemaker which generates the pulses for the working of the heart. Whenever SA node fails to generate the pulse or if the pulse generated is not proper in that case we use instrument is known as pacemaker.

There are two types of pacemaker:

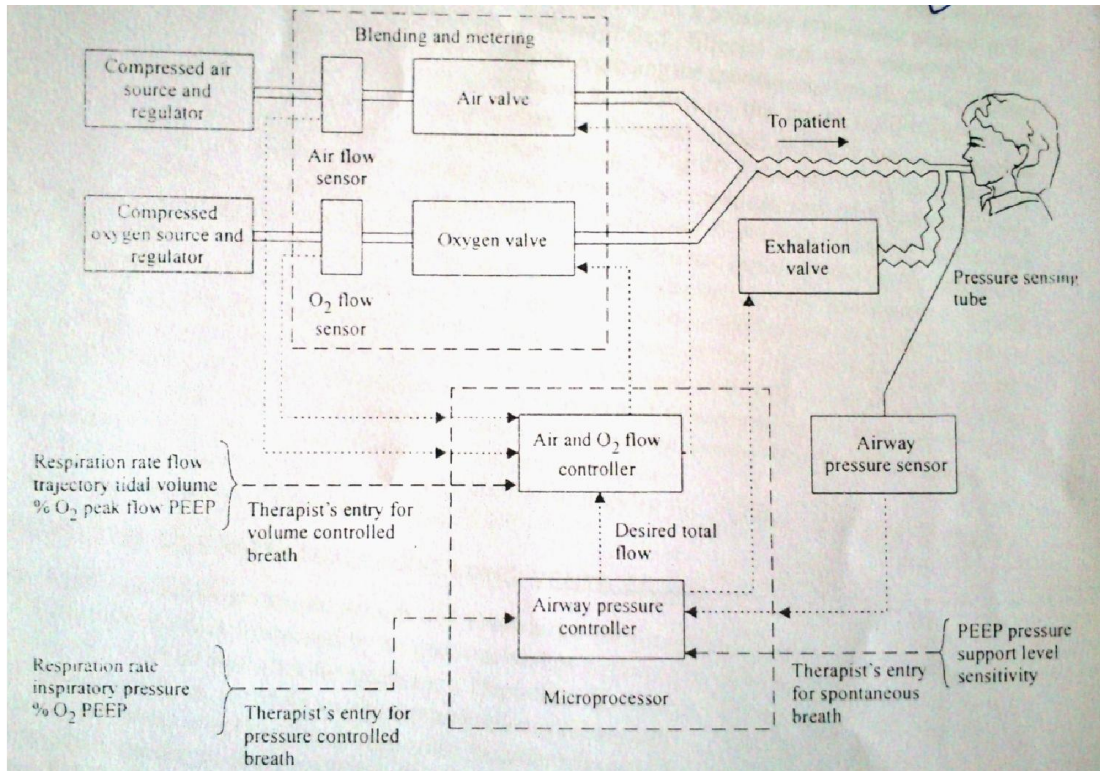
- 2) External pacemaker
- 3) Internal pacemaker

External pacemaker is an instrument which is employed to assure the normal rhythm of heart. In this the pulses of sufficient width and shape are generated at an adjustable rate by using electronic circuitry. These pulses can be delivered to the patients heart by means of electrodes that are specially designed to carry the pulses from machine to the heart. The whole procedure can be continuously monitored with the help of displays and required changes can be done in case of emergency.



b) Draw a block diagram of microprocessor based ventilator

4



c) Explain the procedure carried out for control of drug delivery system

4

Ans :

Drug delivery is the process of applying or injecting drug in the patient's body in solid, liquid or gaseous form. The cure or healing of disease depends on,

1. Drug or Medicine
2. Amount of Drug
3. Type and rate of Drug Delivery method

Automatic Drug Delivery System:



It is the combination of mechanical and electronic system which works for the medical application of drug delivery to the patient.

This system generally provides,

1. Control over rate of drug delivery
2. Indications
 - Audible alarm
 - Visual lights
3. Accuracy
4. Automatic control

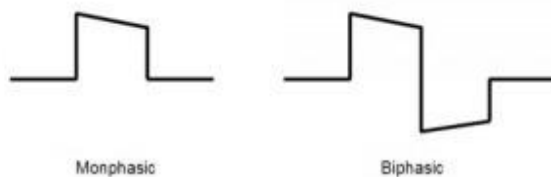
The infusion pump is an electromechanical instrument that facilitates proper delivery of drug in an appropriate proportion and in predetermined time.

d) Explain the Biphasic and Monophasic defibrillator

4

Ans:

2 marks for each



The direct current shock given can have a monophasic or **biphasic wave form**. In monophasic shock, the shock is given in only one direction from one electrode to the other. In a biphasic shock, initially direction of shock is reversed by changing the polarity of the electrodes in the latter part of the shock being delivered. Usually the initial voltage applied is higher than the reversed polarity shock. Biphasic wave forms were initially developed for use in implantable cardioverter defibrillators (ICD) and later adapted to external defibrillators. Biphasic truncated exponential wave form and rectilinear biphasic waveform are two types of biphasic waveforms used by different manufacturers. Defibrillators can sense the thoracic impedance and increase or decrease their internal resistance so that the selected level of energy is delivered to the subject.



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Biphasic shocks are more effective than monophasic shocks and need lesser energy. Typically when 360 Joules are delivered for defibrillation in a monophasic defibrillator, 200 Joules are given in a biphasic defibrillator. This could theoretically reduce the potential damage to the heart muscle by the high voltage shock.

e) Discuss how one can identify the need of heart lung bypass machine for the patient. 4

Ans:

heart–lung machine The *heart–lung machine* is a system which takes over the function of the heart and the lungs with sufficient safety to maintain life while the heart is stopped or opened to allow surgery on the coronary arteries or the heart valves, or to allow repair of congenital abnormalities.

While in theory it is only necessary to bypass the function of the heart, it soon became apparent that in practice it is simpler to bypass the function of both the heart and the lungs.

f) List the technical specifications of Nebulizer 4

Ans :

(any 4 points for 4 marks)

More than 96% of 0.3 micron or larger air borne dust particles is effectively shut out with the air filter to provide purified air for aerosol nebulization. Medication cup with replaceable diaphragm.

Easily detachable fan cover and pneumoclean (Air filter).

Made of highly resistant sterilizable resin.

Stand with solution bottle for safety.

Nebulizing rate: 4 ml/min or greater.

Mist particle size: Approx 1-5 microns.

Nebulizing time setting: 1-30 min & continuous

Medication cup capacity: 150 ml.

Q6. Attempt any FOUR: 16

a) State the maintenance steps carried out for ventilator. 4

Ans: - any 4 steps for 4 mks



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- 1 Check the ON/OFF switch
2. Check the fuse continuity
 3. Check the power cable continuity
 4. Check the Gas Supply.
 5. Check the Pneumatic lines (including air filters).
 6. Check the Gas cylinders (and gauges and regulators, if so equipped)
 7. Check the Patient Circuit
 8. Check the Breathing circuit (including filters)
 9. Check the Humidifiers
 10. Pressure-relief mechanism

b) State the difference between Fixed and demand pacemaker.

4

(any 2 points of each 1 mark for each point)

Fixed pacemaker	Demand Type pacemaker
1) This type of pacemaker uses competitive pacing mode	1) This type of pacemaker uses noncompetitive pacing mode
2) It is Ventricular asynchronous type of pacemaker.	2) It is R-Wave (ventricular) inhibited type of pacemaker.
3) It produces pulses at fixed rate which are independent of any natural cardiac activity.	3) Its output is suppressed as long as natural R wave is present. However output comes in picture when the output goes below the pacer value.
4) It is generally installed in elderly patients whose SA nodes cannot provide proper stimuli	4) It is a ventricular programmed pacemaker.
5) It is having longest battery life.	5) Comparatively less battery life.

c) Draw a block diagram of programmable microprocessor based infusion pump.

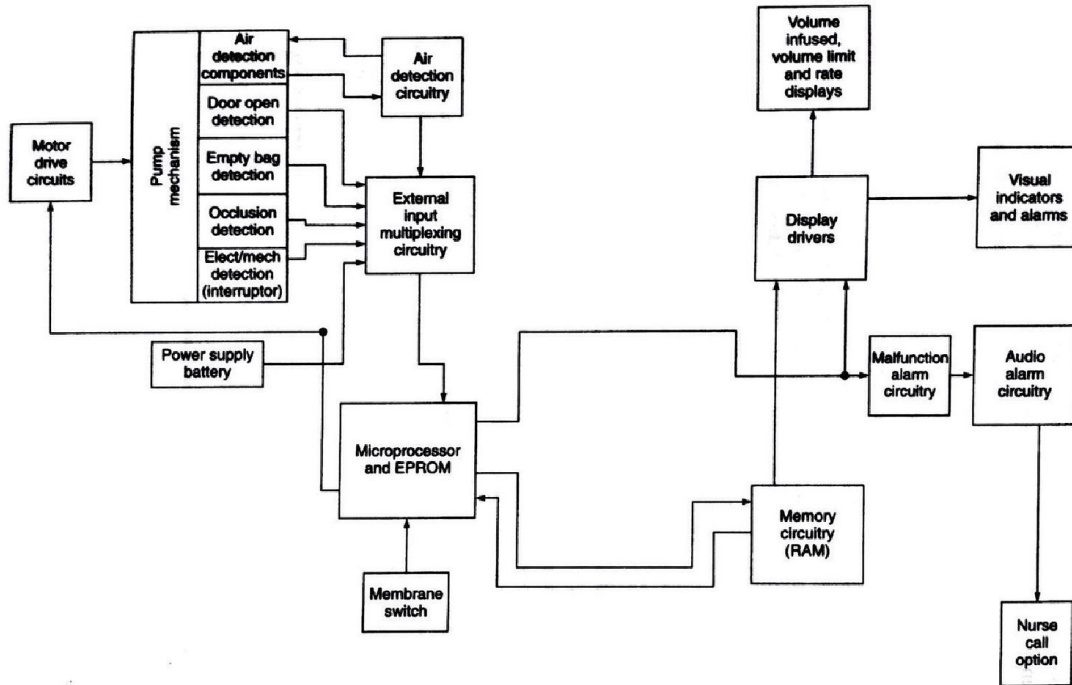
4

(Diagram: 4 marks)

Ans:



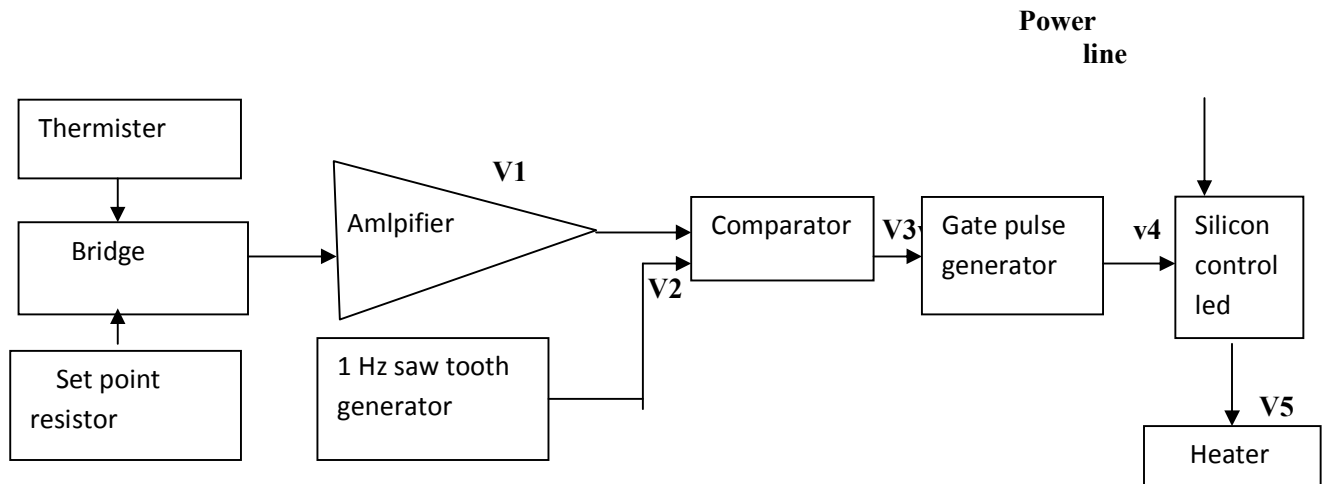
Block diagram of programmable microprocessor based infusion pump :





d) Draw a circuit diagram of temperature control and indicator used in baby incubator
Explain its operation 4

diagram 2 marks explanation 2 marks



Temperature controlled air is passed through the chamber in which the baby is located to maintain it at set temperature. The temperature is controlled in modern units by means of proportional control system which is as shown in fig. Temperature in the air supply lines varies a thermister resistance that is compared with a fixed resistance that corresponds to the set temperature. If the temperature of air entering the infant's chamber is lower than the set temperature power is applied to the heater to correct for difference. In this system, the amount of power applied to the heater is proportional to the difference between the actual air temperature and set point. In this system the thermister in a bridge circuit with the set point resistance as another arm of bridge. The bridge output is amplified, giving the voltage V1 at the output, which is proportional to difference in temp between the thermister and the set point.

e) State the meaning of cardiac arrhythmia. state the significance of Tachycardia Bradycardia.4

Ans :

Cardiac Arrhythmia:- 2 marks

The rhythmic action of heart is initiated by regularly recurring action potential originating at the natural cardiac pacemaker located at SA node. A normal sinus rhythm (NSR) depends on the continuous periodic



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performance of the pacemaker. Any change in the NSR is called an arrhythmia (abnormal rhythm). It occurs if SA node temporarily or permanently fail or a congenital defect

Any disturbance in the heart's normal rhythmic contraction is called an arrhythmia.

Any change in normal sinus rhythm is called an Cardiac Arrhythmia

Significance of Tachycardia Bradycardia: 1 mark for each

Tachycardia :Tachycardia refers to an abnormally fast resting heart rate - usually at least 100 beats per minute.

Bradycardia :In case of arrhythmia the heart is paced at a much slower rate than normal ranging between 30 and 50 beats per minute this condition in which heart beat slower is called bradycardiya in which the heart cannot provide sufficient blood circulation to meet the body's physical demand.