

K.S. GROUP OF INSTITUTIONS
K.S. SCHOOL OF ENGINEERING & MANAGEMENT

15, Mallasandra, Near Vajarahalli, Off. Kanakapura Road, Bengaluru- 560 109
www.kssem.edu.in



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K.S. SCHOOL OF ENGINEERING AND MANAGEMENT



BLUE BOOK

Name of the Student: SHRIKAR. S

Class / Sem : VII SEMESTER Branch: MECHANICAL

USN :

I	K	G	I	7	M	E	0	3	5
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SUBJECT : FPS Subject Code : 17ME72

MAXIMUM MARKS :

Test	I	II	III	Average Marks Obtained
Date			05/01/2021	
Marks Obtained			27	
Signature of the Student			Shrikar S	
Initials of Room Supervisor			Moh	
Initials of Faculty			4	

NAME OF FACULTY : Harsho J

SIGNATURE : [Signature]

SIGNATURE OF H.O.D. : [Signature]

K S SCHOOL OF ENGINEERING AND MANAGEMENT

First Internal test

Q. No	Marks	CO	Q. No	Marks	CO	CO	Total
1(a)			3(a)				
1(b)			3(b)				
1(c)			3(c)				
OR				OR			
2(a)			4(a)				
2(b)			4(b)				
2(c)			4(c)				
						Grand Total	

Second Internal test

Q. No	Marks	CO	Q. No	Marks	CO	CO	Total
1(a)			3(a)				
1(b)			3(b)				
1(c)			3(c)				
OR				OR			
2(a)			4(a)				
2(b)			4(b)				
2(c)			4(c)				
						Grand Total	

Third Internal test

Q. No	Marks	CO	Q. No	Marks	CO	CO	Total
1(a)	5	4	3(a)			4	19
1(b)	5	4	3(b)				
1(c)	5	5	3(c)			5	08
OR				OR			
2(a)			4(a)	4	4		
2(b)			4(b)	5	4		
2(c)			4(c)	3	5		
						Grand Total	27

Signature of the Staff

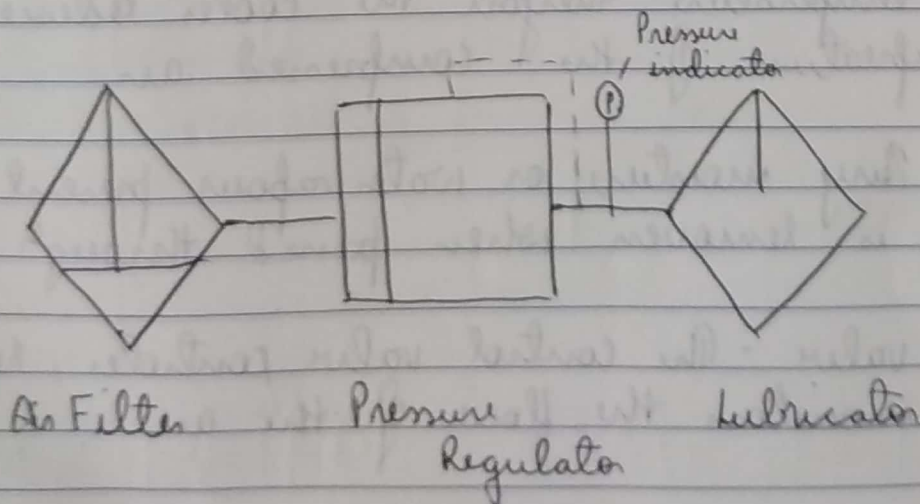
[Q1]

(a) The properties of compressed air are:

- Availability: Air is available literally everywhere in unlimited amounts.
- Storage: Air can be stored in reservoirs easily & utilised when required.
- Transportation: Compressed air can be transported easily and utilised.
- Temperature: Compressed air is insensitive to temperature fluctuations.
- Explosion proof: Compressed air is explosion proof & environment friendly & can be used in all industries.
- Cleanliness: Filtered compressed air is clean.

[Q1]

(b)



Air has to be compressed & processed and has to go through the filter, pressure regulator & the lubricator. This will be done by individual components.

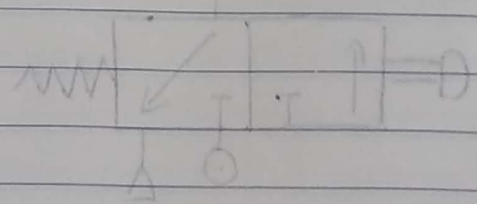
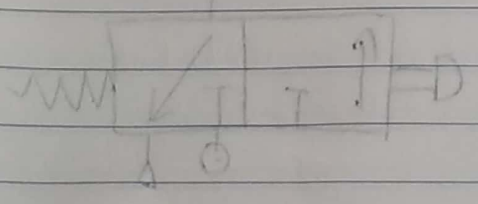
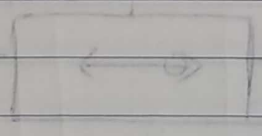
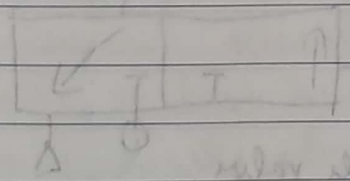
Aggregating all the processes into one single unit is known as service unit. All the processes take place at once rather than passing through each of the filter, regulator and the lubricator.

[Q1]

(c) The components of Pneumatic System are:

- Air filter: The filter removes the suspended particles & cleans the air for further use.
- Compressor: Air is compressed using a compressor. Depending on the need, the capacity of the compressor is chosen.
- Cooler: The air after being compressed will be at a higher temperature. Therefore the cooler reduces the temperature of the compressed air.
- Dryer: Any moisture or water vapour present in the air is removed when passed through the dryer.
- Control valve: The control valve controls, regulates and monitors the flow of the air.

- Air actuator :- The compressed air actuates the movement of the mechanical elements present in the system.
- Electric Motor :- The electric motor converts the electrical energy into mechanical energy.
- Reserve tank :- The air after passing through the compressor gets collected in the reserve tank.



Q4(a)

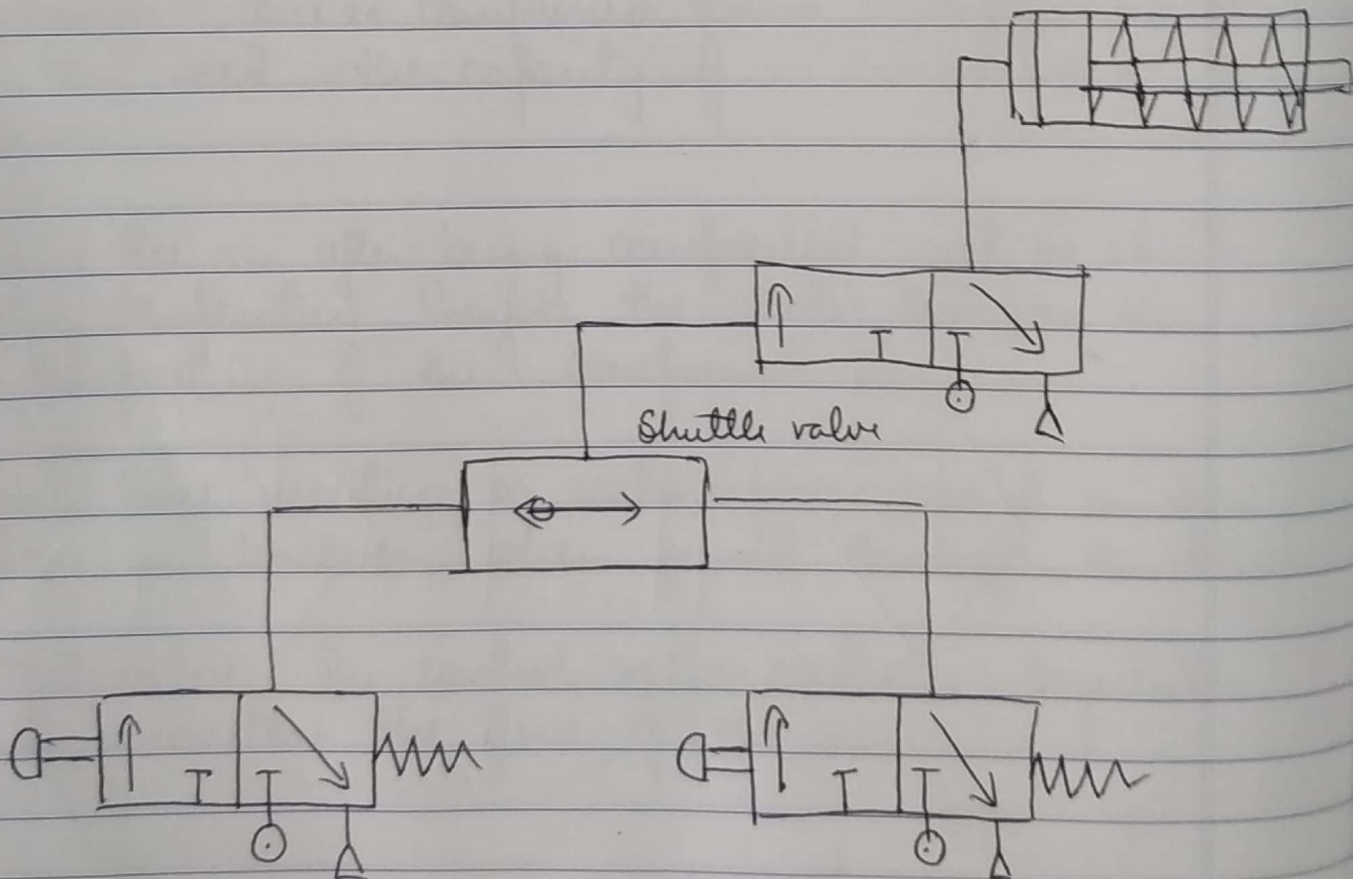
Pneumatic circuit

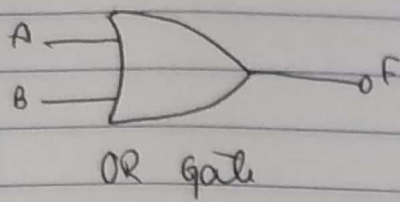
- This does not utilise any electrical components.
- The pneumatic circuit is drawn as a single circuit.
- This uses compressed air for actuation of main control valve.

Electro Pneumatic circuit

- This utilises electrical solenoid valves.
- This is ~~divided~~ ^{divided} into two parts, namely: pneumatics & electrical components.
- This uses electrical energy to actuate the main control valve.

Q4(b)





Input		Output
A	B	F
0	0	0
0	1	1
1	0	1
1	1	1

- The OR gate has two inputs and a single output.
- If the inputs are zero, the output will also be zero.
- If one input is given & the other is zero, the output will be one, or the output will be produced.
- If both the inputs are given, the output will be produced, or the cylinder activation takes place.

Q4(c) Cascading is the method to eliminate the maintained & trimmed signals.

Principle of Cascading

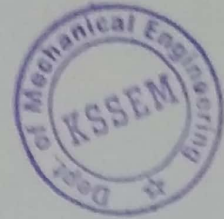
- Divide the circuit into groups.
- Use a simple design technique to determine the minimum number of groups.
- Provide a bus bar signal to all the groups.
- Provide a signal element to the individually active groups.

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BLUE BOOK

Name of the Student: SHRIKAR. S

Class / Sem : VII SEMESTER Branch: MECHANICAL

USN :

I	K	G	I	7	M	E	0	3	5
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SUBJECT : CE Subject Code :

MAXIMUM MARKS :

Test	I	II	III	Average Marks Obtained
Date			06/01/2021	30+10 40
Marks Obtained				
Signature of the Student			<i>Shrikar S</i>	<i>Shrikar S</i>
Initials of Room Supervisor				
Initials of Faculty				

NAME OF FACULTY : VIJAY CHANDAN

SIGNATURE : *Vijay Chandan*

Chand. S
 SIGNATURE OF H.O.D.

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First Internal test

Q. No	Marks	CO	Q. No	Marks	CO	CO	Total
1(a)			3(a)				
1(b)			3(b)				
1(c)			3(c)				
OR			OR				
2(a)			4(a)				
2(b)			4(b)				
2(c)			4(c)				
						Grand Total	

Second Internal test

Q. No	Marks	CO	Q. No	Marks	CO	CO	Total
1(a)			3(a)				
1(b)			3(b)				
1(c)			3(c)				
OR			OR				
2(a)			4(a)				
2(b)			4(b)				
2(c)			4(c)				
						Grand Total	

Third Internal test

Q. No	Marks	CO	Q. No	Marks	CO	CO	Total
1(a)			3(a)				
1(b)			3(b)				
1(c)			3(c)				
OR			OR				
2(a)			4(a)				
2(b)			4(b)				
2(c)			4(c)				
						Grand Total	

Signature of the Staff

Q9(a)

$$G(s) = \frac{2}{s(s+1)(0.2s+1)}$$

In place of s replace with $j\omega$

$$G(j\omega) = \frac{2 + j0}{j\omega(j\omega+1)(1+0.2j\omega)}$$

Now, phase angle

$$\phi = \tan^{-1}\left(\frac{0}{2}\right)$$

$$\tan^{-1}\left[\frac{\omega}{0}\right] + \tan^{-1}\left[\frac{\omega}{1}\right] + \tan^{-1}\left[\frac{0.2\omega}{1}\right]$$

$$\phi = \tan^{-1} 0 - \tan^{-1}\left[\frac{\omega}{0}\right] - \tan^{-1}[\omega] - \tan^{-1}[0.2\omega]$$

$$\phi = 0 - 90^\circ - \tan^{-1}[\omega] - \tan^{-1}[0.2\omega]$$

Frequency in rad/sec	Phase angle in degrees
0.1	-96.85
0.2	-103.60
0.3	-110.13
0.4	-116.37
0.5	-122.27
1	-146.30
2	-175.23
3	-192.52
4	-204.62
5	-213.69

10	-937.79
20	-953.10
30	-958.62
40	-961.44
50	-963.14
∞	

Factor	Corner frequency rad/sec	Slope	Resultant dB/dec
2	None	$20 \log_{10} K = 6 \text{ dB}$	-
$(1/s)$	None	-20 dB/dec	-20
$(1/s+1)$	1 rad/sec	-20 dB/dec	-40
$(1/0.25s+1)$	5 rad/sec	-20 dB/dec	-60

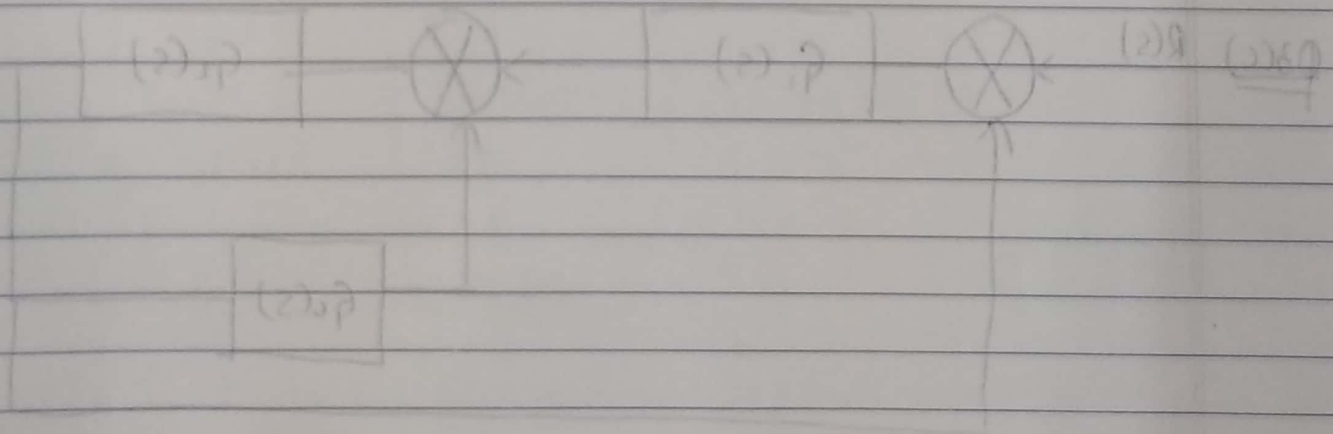
Q2(b)
 GCF = 1.6 rad/sec
 PCF = 2.5 rad/sec

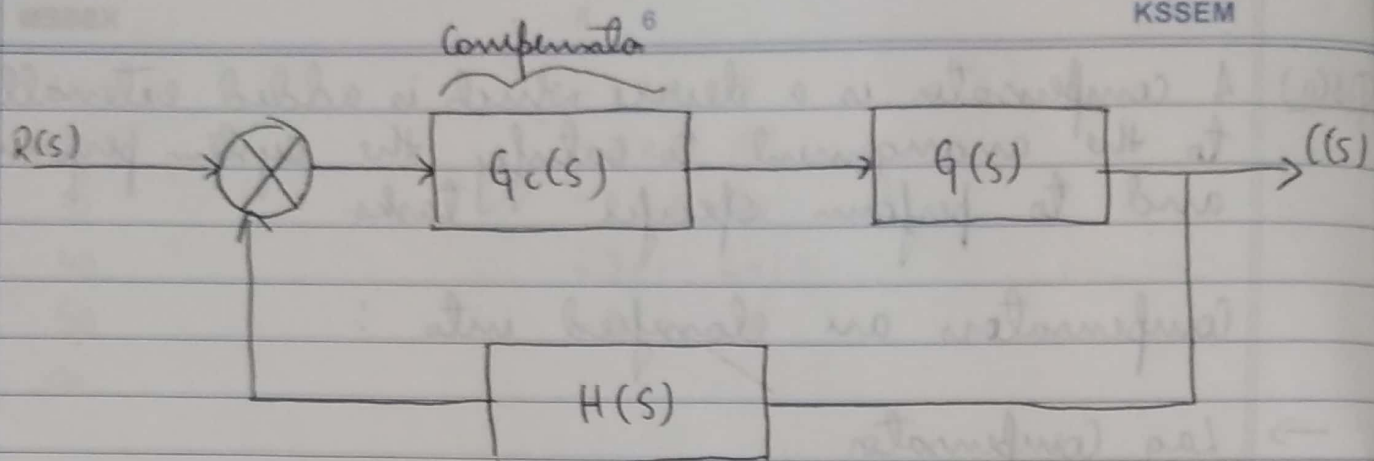
Q2(c)
 GM = 12 dB/dec
 PM = 24°

Q3(a) A compensator is a device which is added externally to the arrangement to satisfy the system performance and to perform specific tasks.

Compensators are classified into :

- Lag Compensator
- Lead Compensator
- Lag-Lead Compensator



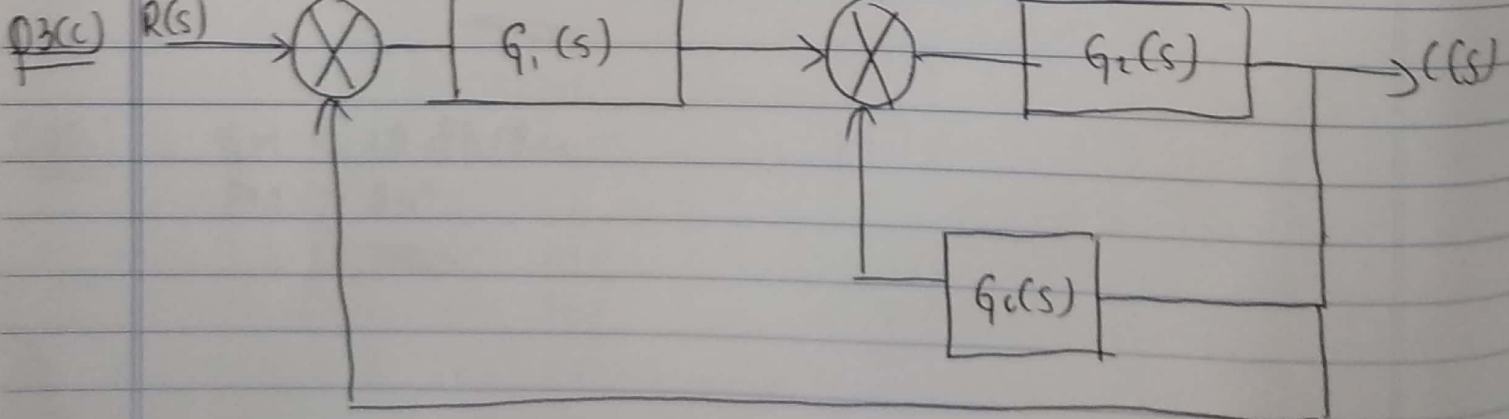
Q3(b)

The above figure shows the block diagram of a series compensator.

In this an external device known as a compensator which has a feedback system is introduced in series with the forward feedback system.

This is known as series compensator. This is also known as cascade compensator. In this arrangement the signal flows from lower energy to higher energy. Therefore an external device such as an amplifier is used.

Hence there are more number of components used in series compensator.



The above figures show the block diagram of a parallel compensator system.

In this an external device known as a compensator which has a feedback system is introduced as a feedback to the circuit. This is also known as feedback compensation.

In this arrangement the signal flows from higher energy to lower energy. Therefore ~~no~~ external devices like amplifiers are ~~required~~.

30/30

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BLUE BOOK

Name of the Student: SHRIKAR S

Class / Sem : VII SEMESTER Branch: MECHANICAL

USN :

1	K	G	I	7	M	E	0	3	5
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SUBJECT : TRIBOLOGY Subject Code : 17ME742

MAXIMUM MARKS :

Test	I	II	III	Average Marks Obtained
Date			07/01/2021	
Marks Obtained	30	30	15 30	30 + 10 <u>40</u>
Signature of the Student			<i>Shrikar S</i>	<i>Shrikar S</i>
Initials of Room Supervisor			A	
Initials of Faculty			A	A

NAME OF FACULTY :

SIGNATURE : *A*

Chaitanya S
 SIGNATURE OF H.O.D.

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First Internal test


Q. No	Marks	CO	Q. No	Marks	CO	CO	Total
1(a)			3(a)				
1(b)			3(b)				
1(c)			3(c)				
OR			OR				
2(a)			4(a)				
2(b)			4(b)				
2(c)			4(c)				
						Grand Total	

Second Internal test

Q. No	Marks	CO	Q. No	Marks	CO	CO	Total
1(a)			3(a)				
1(b)			3(b)				
1(c)			3(c)				
OR			OR				
2(a)			4(a)				
2(b)			4(b)				
2(c)			4(c)				
						Grand Total	

Third Internal test

Q. No	Marks	CO	Q. No	Marks	CO	CO	Total
1(a)	5	CO4	3(a)	5	CO4	CO4	15
1(b)	5	CO4	3(b)	5	CO4		
1(c)	5	CO5	3(c)	5	CO5	CO5	15
OR			OR				
2(a)			4(a)				
2(b)			4(b)				
2(c)			4(c)				
						Grand Total	30


 Signature of the Staff

Q1(a) Dry friction is also known as solid state friction & it means that there is no coherent liquid or gas lubricant present between two solid surface. Therefore many theories have been given on dry friction & some of them are:

→ Theory by Leonardo Da Vinci: The elements of same weight will have equal friction at the beginning of movement, even though the lengths and breadths of the elements are different.

→ Theory by G. Amontons: Friction is independent of the area of contact between two surfaces. Friction is directly proportional to the normal application of load. He said that friction depends on the angle of application of load on the surface.

The test measures are:

→ Spring balance: A spring balance connected to a block & when the force is increased on the block, the block starts sliding. The reading in the balance when the block starts sliding measures the static friction & the reading when the block continues to slide measures the dynamic friction.

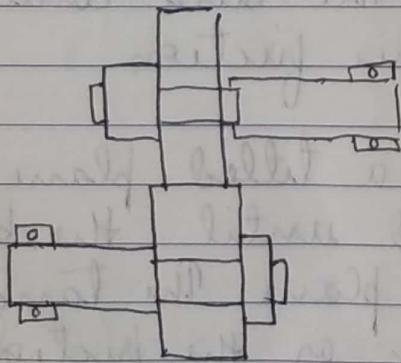
→ Tilt level: A block is placed on a tilted plane & when the angle of tilt is increased until the block starts sliding down on the plane. The tangent of the angle produced is known as the friction angle.

Q1(b) The mechanism of wear is classified as:

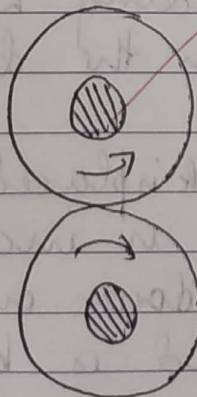
- Adhesive wear
- Abrasive wear
- Cavitation
- Corrosive wear
- Erosive wear
- Frictional wear
- Fretting

The method of testing is:

- Sliding rolling wear testing: The sliding rolling wear tester is one of the most popular tribometers to investigate wear and frictional properties of materials under the condition of rolling, sliding or a combination of both rolling & sliding. Two rollers connected to two parallel shafts are pressed together to have a contact. Using an electric motor & a gear train, the rollers are rotated along with the shaft and the wear is noted down.



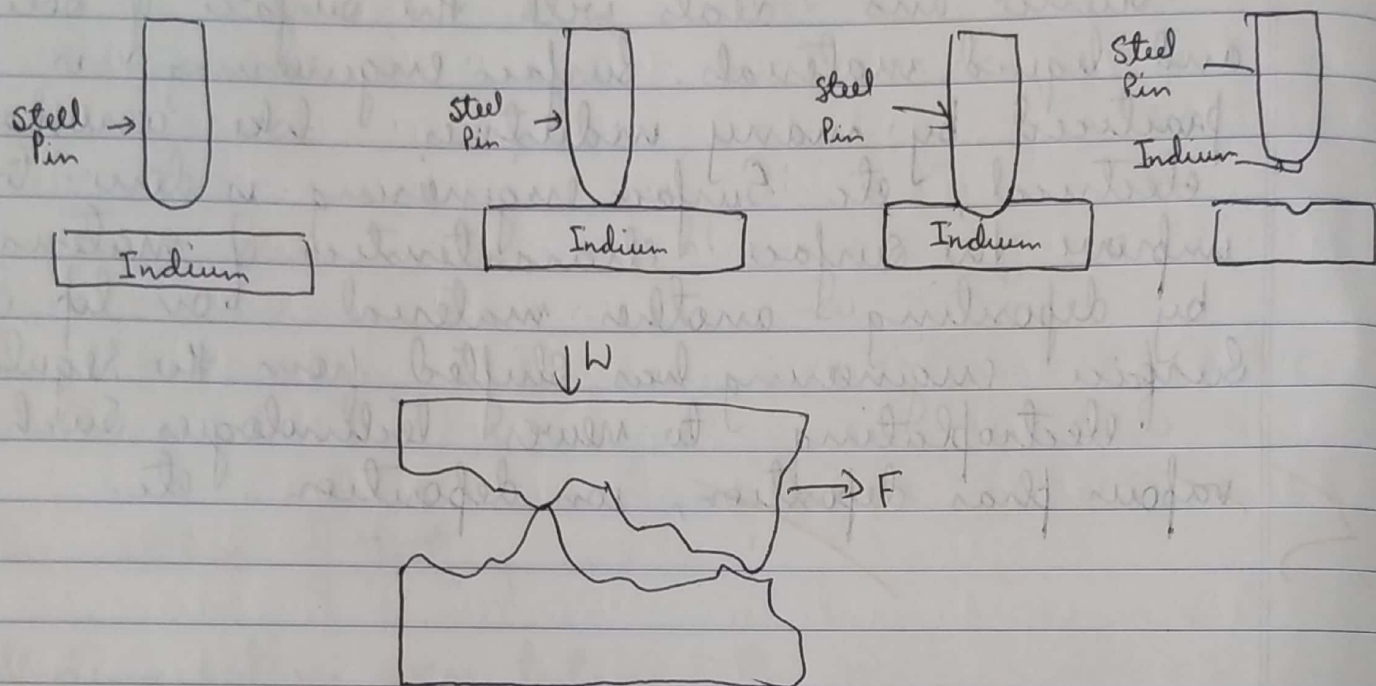
Roller on roller



Roller on bar

Q1(c) Surface engineering is a sub domain of material science and deals with the surface of solid and liquid materials. Surface engineering is practiced by many industries like, aerospace, electrical, etc. Surface engineering is done to improve the surface characteristics of materials by depositing another material on top of it. Surface engineering has shifted from the regular electroplating to newer technologies such as vapour phase deposition, ion deposition, etc.

Q3(a) Adhesive wear



Adhesive wear.

Adhesive wear is the removal of material from a surface by another material on application of load. Let us take the example of Indium & steel pin. When the steel pin applies load on the indium and after the load is removed, ~~the indium~~ some part of the indium metal is removed and gets stuck to the steel pin. This happens due to strong adhesive force between the two metals.

Abrasive wear

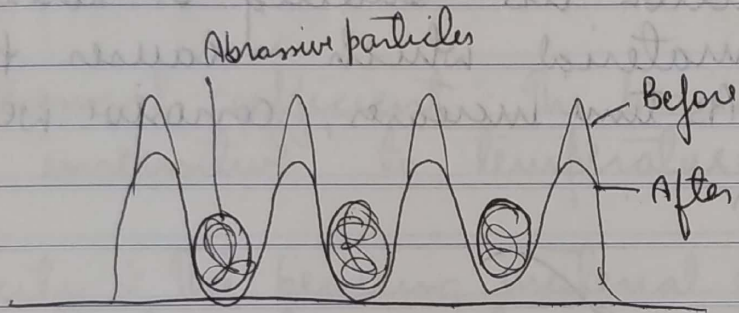
~~A~~ Abrasive wear is the removal of material by hard particles which slide or roll over the surface.

Scratching is also a type of abrasive wear.

When hard particles slide or roll over softer material, it removes the surface material.

There are two types of abrasive wear:

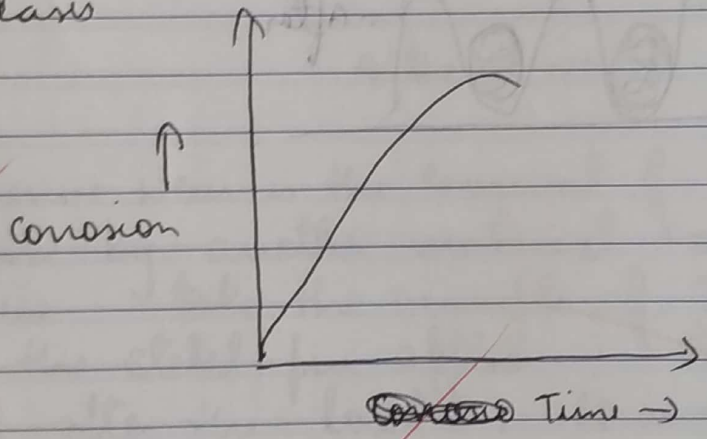
- Two body abrasive wear
- Three body abrasive wear



Q3(b) Corrosive Wear

Corrosive wear occurs due to chemical reaction & mechanical action on the surface of a material. One is the material and the other is the corrosive agent, like moisture or chemical reactant which causes the corrosive wear.

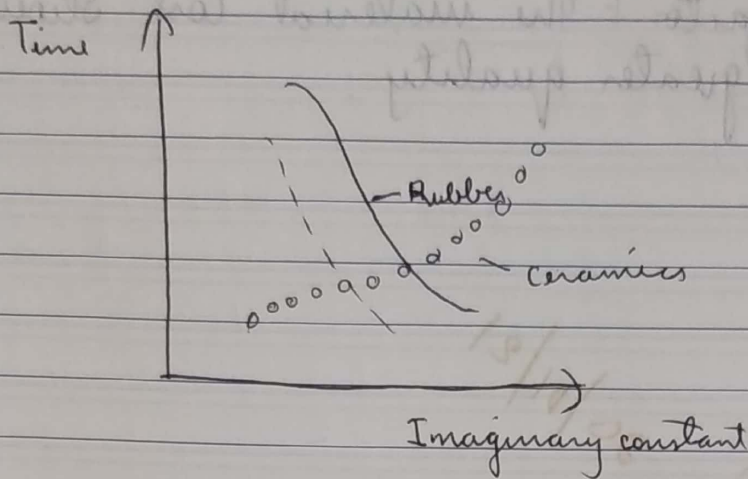
When the chemical reaction occurs and oxidation takes place on the surface of the material, the mechanical action like sliding or rolling removes the surface material which causes the degradation. As time increases, corrosive wear also increases.



Erosive Wear

Erosive wear is the removal of material by impinging particles on the surface.

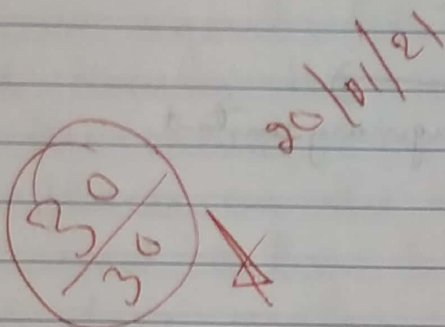
When water flows continuously on rocks, the particles present in water impinge on the rock and remove the surface & therefore wear occurs.



Q3(c) The properties are :

- High thermal coefficient : The bearing material should be insensitive to temperature changes.
- Elasticity : The bearing material should be elastic and should return to its original state after the load has been removed.
- Low coefficient of friction : The bearing materials should have low coefficient of friction when two surfaces are in contact. This increases the life of the bearing.
- Non corrosive : The bearing material should be corrosion resistant & should not react to the lubricants used.
- Availability : The materials should be readily available in plenty & should not be available even for replacement & repair.

Economic factor - The material cost should be minimized with greater quality.



12/10/21

High thermal coefficient: The bearing material should be chosen so that its expansion is not too large.

Elasticity: The bearing material should be chosen so that it returns to its original state after the load has been removed.

Low coefficient of friction: The bearing material should be chosen so that the coefficient of friction is low.

Two surfaces are in contact: The bearing material should be chosen so that the coefficient of friction is low.

Life of the bearing: The bearing material should be chosen so that its life is long.

Low corrosion: The bearing material should be chosen so that it does not corrode.

Availability: The bearing material should be available in the market.

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BLUE BOOK

Name of the Student: SHRIKAR.S

Class / Sem : VII SEMESTER Branch: MECHANICAL

USN :

I	K	G	I	7	M	E	0	3	5
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SUBJECT : MECHATRONICS Subject Code : 17ME753

MAXIMUM MARKS :

Test	I	II	III	Average Marks Obtained
Date			08/01/2021	$\frac{36}{40}$
Marks Obtained	$\frac{27}{30}$	$\frac{30}{30}$	$\frac{22}{30}$	
Signature of the Student			<i>Shrikar.S</i>	<i>Shrikar.S</i>
Initials of Room Supervisor			<i>E</i>	
Initials of Faculty	<i>E.</i>	<i>J.</i>	<i>M.</i>	<i>A.</i>

NAME OF FACULTY : Dr. J. Prashanth

SIGNATURE : *Prashanth*

Chaitan
 SIGNATURE OF H.O.D.

K S SCHOOL OF ENGINEERING AND MANAGEMENT

First Internal test

Q. No	Marks	CO	Q. No	Marks	CO	CO	Total
1(a)			3(a)				
1(b)			3(b)				
1(c)			3(c)				
OR		OR					
2(a)			4(a)				
2(b)			4(b)				
2(c)			4(c)				
						Grand Total	

Second Internal test

Q. No	Marks	CO	Q. No	Marks	CO	CO	Total
1(a)			3(a)				
1(b)			3(b)				
1(c)			3(c)				
OR		OR					
2(a)			4(a)				
2(b)			4(b)				
2(c)			4(c)				
						Grand Total	

Third Internal test

Q. No	Marks	CO	Q. No	Marks	CO	CO	Total
1(a)	-5-	-4-	3(a)	-3-	-4-	-4-	-14-
1(b)	-3-	-4-	3(b)	-3-	-4-		
1(c)	-4-	5-	3(c)	-4-	-5-		
OR		OR					
2(a)			4(a)				
2(b)			4(b)				
2(c)			4(c)				
						Grand Total	22/30

Signature of the Staff

Q1(a) Microprocessors have evolved over the years drastically

4-bit microprocessor: Intel in 1971 released the 4 bit microprocessor, 4004. It had a clock speed of 108 KHz

8-bit microprocessor: Intel in 1972 released the first 8-bit microprocessor, 8008. It had a clock speed of 216 KHz

16-bit microprocessor: Intel in 1978, released the 16 bit microprocessor, 8036. It had a clock speed of 5 MHz and it consisted of 29,000 transistors.

32-bit microprocessor: Intel in 1985, released the 32 bit microprocessor. It had a clock speed of 160 MHz and it consisted of 2,75,000 transistors.

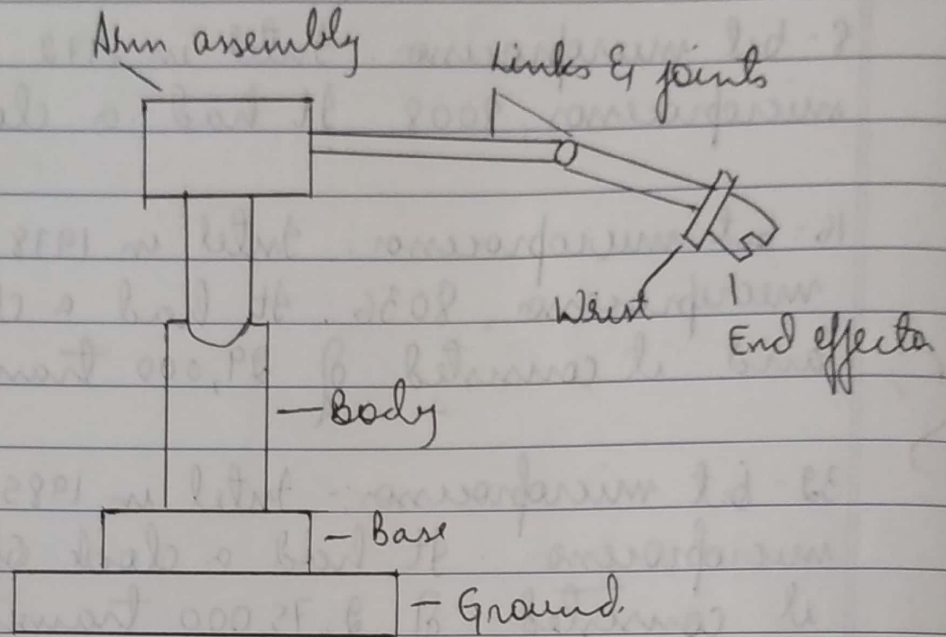
64-bit microprocessors: In the early 2000's the 64 bit architecture came into existence. In 2003 AMD released their 64 bit microprocessor followed by Intel.

Q1(b) The basic elements of control system are:

- Program counter: This holds the address of the information to be executed and all the other instructions are stored in the memory address.
- Information registers: As the name suggests, it holds the information that is to be executed & is also known as current information registers.

→ Status register: ^{In the} ~~This~~ status register, every bit represents different flag value which is either 'yes' or 'no'. This is used to give out the result.

Q1(c)



Usually the robots used in industries are mounted on the ground with the help of a base.

The robot has an arm assembly which consists of links & joints.

The joints help in the effective movement of the robot.

The end of the arm assembly has the wrist which is also known as manipulator.

At the end of the wrist is the hand which is also known as the end effector.

Q3(a) Assembler : Assembler is the one which converts the assembly level language into machine language. The assembler which is used in the microcontroller itself is known as the self assembler. The assembler which is used in the computer other than that which is used to execute object code is known as the cross assembler.

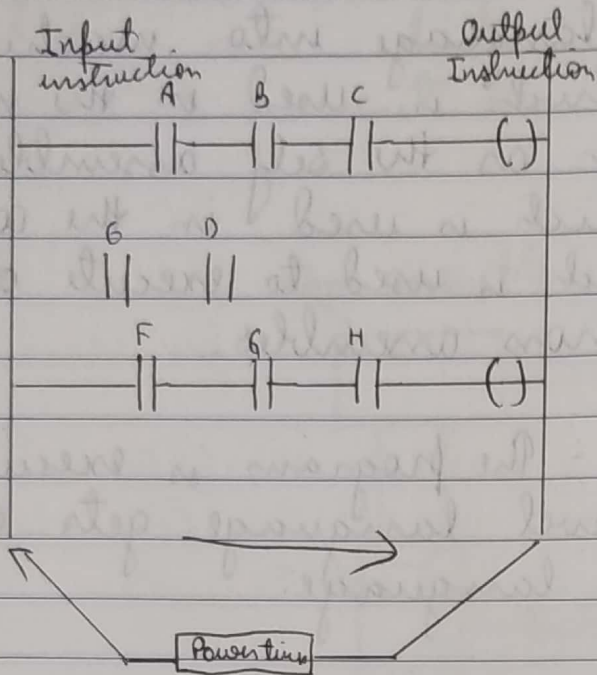
Instruction cycle : The program is executed when the assembly level language gets converted into machine language.

Q3(b) Bus : It is the combination of wires and connections which is used to transfer data from the microprocessor computer to the memory. It acts as a ~~transfer~~ intermediate medium to transfer the data and signals between the important parts of the computer system.

The types of buses are :

- Address bus
- Data bus
- Control bus

Q3(c)



~~Q3(a)~~ There is one vertical line on the left and two horizontal lines branch out from it towards the right.

The signal always flows from left to right.

The vertical line is known as the bus bar.

~~22/23~~

~~Shakshani~~
9/1/21

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K.S. SCHOOL OF ENGINEERING AND MANAGEMENT



BLUE BOOK

Name of the Student: SHRIKAR. S

Class / Sem : VII SEMESTER Branch: MECHANICAL

USN :

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SUBJECT : ENERGY ENGINEERING Subject Code : 17ME71

MAXIMUM MARKS :

Test	I	II	III	Average Marks Obtained
Date	04/01/2021		04/01/2021	27 + 10 = 37
Marks Obtained	30	30	30 20	
Signature of the Student	<i>Shrikar S</i>		<i>Shrikar S</i>	<i>Shrikar S</i>
Initials of Room Supervisor			<i>SR</i>	
Initials of Faculty			<i>Prabhu VS</i>	

NAME OF FACULTY : PRA BHU VS

SIGNATURE : *[Signature]*

[Signature]
SIGNATURE OF H.O.D.

K S SCHOOL OF ENGINEERING AND MANAGEMENT

First Internal test

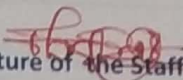
Q. No	Marks	CO	Q. No	Marks	CO	CO	Total
1(a)			3(a)	05			
1(b)			3(b)	05			
1(c)			3(c)	05			
OR			OR				
2(a)	05		4(a)	0			
2(b)	05		4(b)				
2(c)	05		4(c)				
						Grand Total	30

Second Internal test

Q. No	Marks	CO	Q. No	Marks	CO	CO	Total
1(a)	05		3(a)				
1(b)	05		3(b)				
1(c)	05		3(c)				
OR			OR				
2(a)			4(a)	05			
2(b)			4(b)	05			
2(c)			4(c)	05			
						Grand Total	30

Third Internal test

Q. No	Marks	CO	Q. No	Marks	CO	CO	Total
1(a)	5		3(a)				
1(b)	5		3(b)				
1(c)			3(c)				
OR			OR				
2(a)			4(a)				
2(b)			4(b)	5			
2(c)			4(c)	5			
						Grand Total	20


 Signature of the Staff

III INTERNAL

Q1(a) Given, $V = 15 \text{ m/s}$
 $T = 15^\circ\text{C}$
 $D = 115 \text{ m}$
 Speed = 40 rpm

$$\text{Density of air, } \rho_{\text{air}} = \frac{P}{R \times T} = \frac{1.013 \times 100}{0.287 \times 288} = 1.2256 \text{ Kg/m}^3$$

$$\text{Power density} = \frac{P}{A} = \frac{1}{2} \rho_{\text{air}} V^3 = \frac{1}{2} \times 15^3 \times 1.2256$$

$$= \underline{\underline{2068.1348 \text{ W/m}^2}}$$

$$\text{Max power density} = \frac{P_{\text{max}}}{A} = \frac{8}{27} \times \rho_{\text{air}} \times A \times V^3$$

$$= \frac{8}{27} \times 1 \times 15^3 \times 1.2256$$

$$= \underline{\underline{1225.6 \text{ W/m}^2}}$$

$$\text{Obtainable power density} = \eta \times \frac{P}{A} = 0.35 \times$$

$$= \underline{\underline{723.847 \text{ W/m}^2}}$$

$$\begin{aligned}
 \text{Total Power} &= \text{Power density} \times A \\
 &= 723.847 \times \frac{\pi}{4} \times 115^2 \\
 &= \underline{7518521.55 \text{ W}}
 \end{aligned}$$

Q1(b) Advantages

- It is a non polluting source of power generation.
- It is naturally occurring & no infrastructure is required.
- No harm is done to the marine life.
- No waste is generated which would affect the marine life.
- There is optimum power generated during high tides.

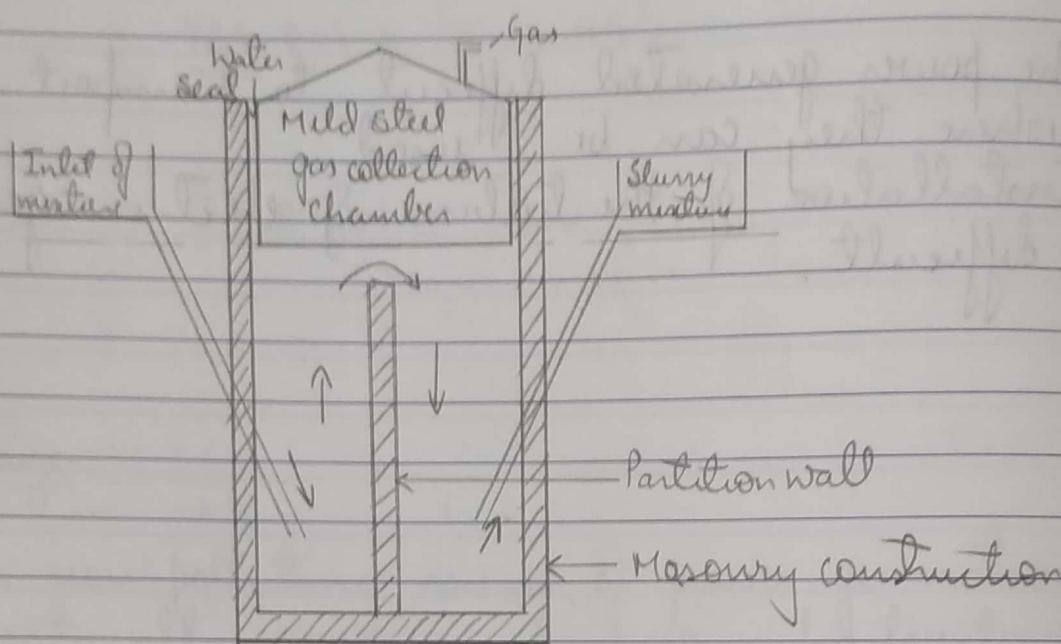
Disadvantages

- ^{Optimum} Power generation occurs only when there is high tide.
- This depends on the lunar activity, as tides are caused due to lunar activity.
- The basin type location will not be available everywhere.
- Transportation of the stored energy is difficult.

Limitations

- The power generated difficult to transport to locations where they can be used.
- Installation of the turbine & electric generator is difficult.

Q4(c)

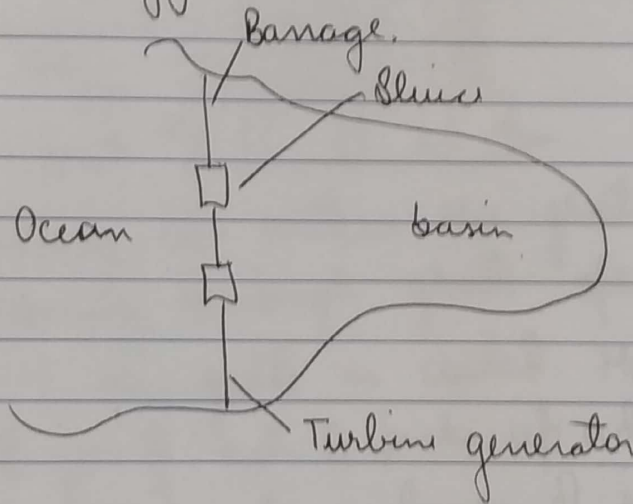


Khadi Village Industries Commission

Various types of ~~KVIC~~ digester plants are used around the world. The Khadi Village Industries Commission digester was designed in India & is being used. This consists of a mild steel tank which works as a gas chamber. This is the most expensive part of the digester. The digester part is underground & it is a masonry construction which has a partition wall. The use of the partition wall helps in providing optimum conditions for the acids & methane element. This KVIC digester works best when the ~~feed~~ ^{raw element} is in sufficient quantity.

Q4(b) Tidal energy is harnessed using either single basin system or double basin system.

The single basin system is the most basic & simple form of energy harnessing. The water fills the basin during flood tide & exits it during the ebb tide. When the water exits to the ocean during ebb tide the water goes through the turbine intern generating energy.



The double basin system has two basins and one turbine generator. The water fills one basin intermittently during the flood tide & empties the other basin during the ebb tide. This generates continuous energy although in small quantities. The main disadvantage of this system is that there is 50% potential energy sacrifice due to the variation in water level ~~between~~ ~~the~~ in the two basins.

