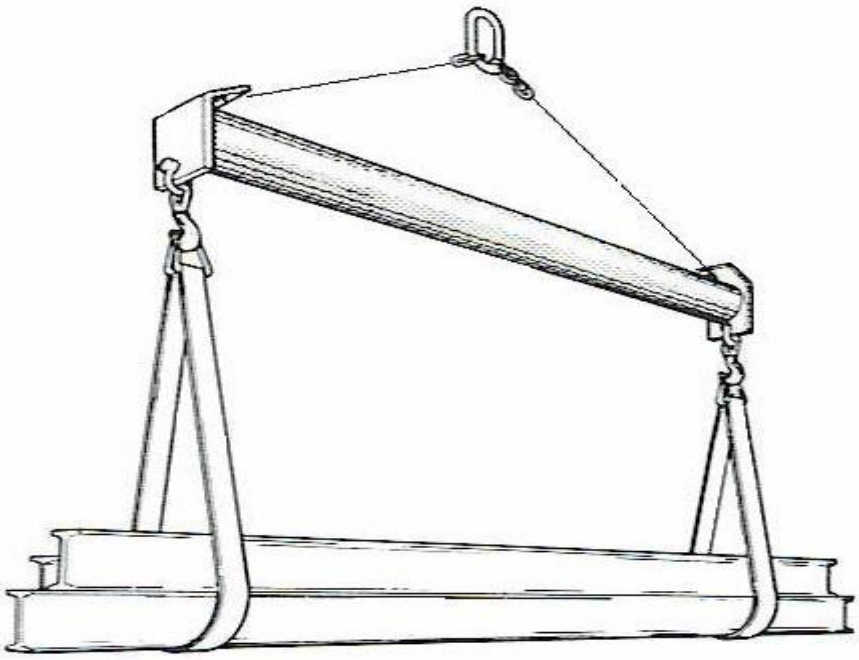
SUMMER – 16 EXAMINATIONS

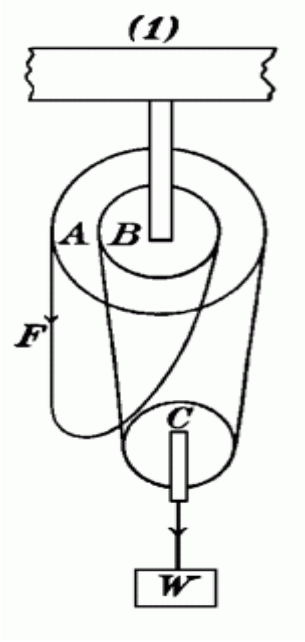
Subject Code: **17623** **Model Answer** Page No: ____/ N

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 judgment 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.	MODEL ANSWER	MARKS	TOTAL MARKS
Q.1 a	**Attempt any THREE**	**3x4**	**12**
i	The Characteristics and features of natural fibre rope are: • For lifting Lighter loads • They are smooth glossy and strong • Stretch up to 25% on loading. • Water resistant up to certain limit • Used as core in Steel wire rope. • Last longer and not expensive	**1 m per point**	**4 m**
ii	Various Hoisting tools and equipments are: • Ropes • Slings • Splices • Connecting tools • Chain hoist • Cranes	2m for enlist and 2 m for uses	**4 m**

	A drift pin is not used as a punch in the traditional sense of the term. Drift pins are especially useful for alighting fastener holes in structural steel members. Spud wrenches used for assembling trusses and steel beams have tapered handles to use as drift pins.		
iii	 spreader bars are used to : 1) Spreader bar are used while lifting huge containers. 2) The spreader bar is used to avoid toppling of the load and for better balance. 3) It is used even to avoid damage to the sling or rope used for lifting. 4) The horizontal bar usually used to hoist loads are not sufficiently protected by slings legs.	**1m per point**	
iv	Differential Chain hoist. • Sketch:-	**2 m sketch and 2m uses**	**4 m**

	 uses 1. They are often used in industrial disciplines such as construction and manufacturing 2.It is least expensive and simplest form of mechanical lifting 3. Primary this hoist is suited for interminent service where occasional light lifting is required i.e. where time and efforts are not factors. 4. It is sometimes used with a trolly when movement of the load to remote pointd is necessary		
b	**Attempt any ONE**	**1x6**	**6**
i	• An accident is an unwanted event that is never scheduled or planned. All accidents are caused are the result of human error, and they involve unsafe behaviour or an unsafe condition, or a combination of both.	**2m define** **2m for causes** **(1m per**	**6 m**

	Major causes of accidents are: 1) Component failure 2) Deviation from normal operating condition. 3) Human and organization error 4) Outside accident interference 5) Natural forces. 6) Act of mischief 7) unsafe working conditions Care to be taken are: 1. Regular plant maintenance 2. Keep the work area clean and dry. Damp or wet work areas can result in injury. 3. NEVER OVERLOAD .Make sure the operator be familiar with the hoist controls before being authorized to operate the hoist. 4. DO NOT walk under a suspended load. DO NOT perform any work on a suspended load that requires a worker to be positioned under the suspended load 5. DO NOT LIFT PERSONNEL. DO NOT LIFT LOADS OVER PEOPLE. 6. DO NOT operate hoist if any damage or malfunctions exist. 7. DO NOT use the hoist load chain as a sling to wrap around the load. • DO NOT use the hoist in such a way that could result in shock or impact loads being applied to the hoist. 8. DO NOT attempt to lengthen the load chain or repair damaged load chain. DO NOT operate beyond the limits of the load chain travel. 9. Make sure all persons stay clear of the supported load.	**point)** **2m for care (1m per point)**	

	10. Make sure load slings or other approved single attachments are properly sized, rigged and seated in the hook saddle.		
ii	Need for erection costing • To Find out the overall cost of project • To Plan financial resources • To Ensure optimal cost • To try to Minimizing cost in particular area of erection works Steps in costing • To find cost of direct material used for installation or erection purpose • To find labor cost • to find out the cost of administration • To find out the overheads	**3m for need(1m per point)** **3m for steps(1m per point)**	**6 m**
Q.2.	**Attempt any TWO**	**2x8**	**16**
a.	Precautions to be taken in handling and storing Synthetic fiber rope 1. Although it has strong water resistance It should be stored in dry place as to avoid damage due to prolonged exposure to water. 2. It should not be used in places where there is possibility of direct contact with concentrated acids or chemicals. 3. Proper inspection of SFR should be carried out at regular intervals. 4. SFR should be stored in cool and dry place but not in frozen condition. 5. Synthetic fiber rope should be coiled, or kept, so that it is ready for	**4m for precautions and 4 m for inspection (1m per point)**	**8 m**

<table>
<tr><td></td><td>use when needed: kink free, knot free, and twist free.

6. Synthetic fibre rope should be stored in a suitable clean, dry place out of direct sunlight and away from extreme temperature

7. Do not store Synthetic fiber rope on dirty floors or drag over rough ground – dirt and grit can work between the fibers and cause abrasion damage.

Inspection of Synthetic fiber rope

• Counting of broken wires

• Construction and size of ropes

• Careful inspection should be done of strands of ropes and core of ropes

• Inspection is done for wear, rust, cuts, longitudinal cut</td><td></td><td></td></tr>
<tr><td>b.</td><td>The objectives for devicing hoist signals.

1) To reduce the no.of accidents.

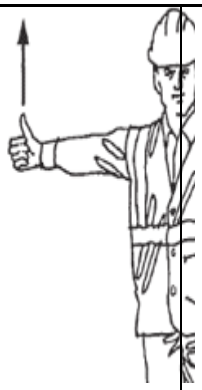
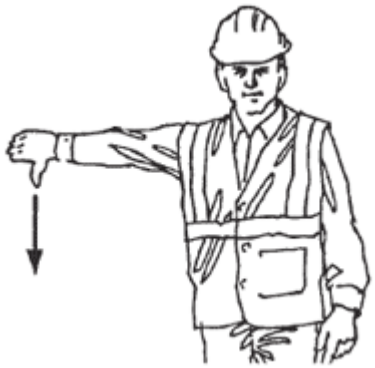
2) Signals should be properly understood by the crane operators.

3) It is desirable to fix a copy of signal codes in the crane cabins

4) the crane operators should take the signal only from one authored persons

<table><tr><td>Boom up</td><td>Boom down</td></tr><tr><td>Arm extended, fingers closed, thumb pointing upward.</td><td>Arm extended, fingers closed, thumb pointing downward</td></tr></table></td><td>4 m for objectives (1m per point)

4 m for comparison (2m for sketch)</td><td>8m</td></tr>
</table>

	  It is the hoisting signal to raise the load It is the hoisting signal to lower the load		
c.	Leak test 1) the euipment has to be installed and then the test is performed on it 2) The type of leak opening include a very tiny pin hole crack or micro – cracks or inadaquate sealing between components or parts to be joined 3) Container ,vessels or other fluid system are sometimes tested for leaks to see if there is any leakge to find the leak and also to take corrective actions against it. 4)There are several methods for leak testing depending on the situation,depending on material,presuure etc.different methos can be applied 5)Pressure test are performed to ensure safety,relabilty etc. 6)There are two major methods of pressure test hyrostatic test and pneumatic test 7)hydsrostatic test is performed by using water as the test medium,whereas pneumatic test uses air,nitrogen or any other non toxic gas **OR** Alignment Test 1)Alignments test can be done by using spirit level,square gauge,dial gauges,wainess meter,squreness test,straight adjust test etc 2)The machine should be carefully levelled up by means of spirit level befor	**8 m** **(1m per point)**	**8 m**

<table>
<tr><td></td><td>starting with the actual installation.

3)Before various tests on any machnine are carried out,it is veryessential that it should be installed in truly horizontal and vertical plane.

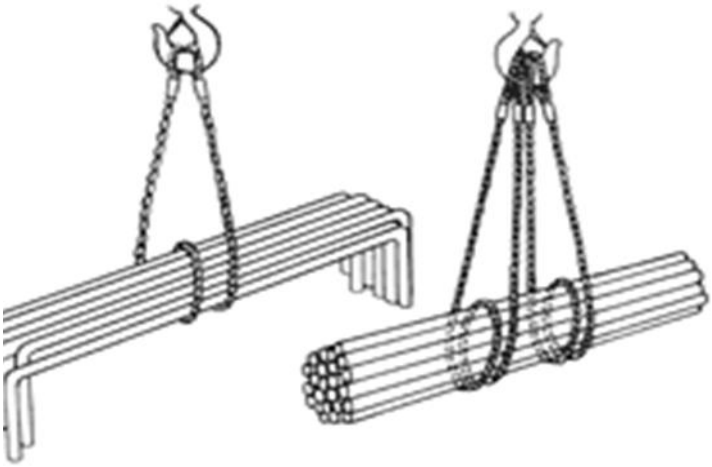
4)In horizontal plane,both longitudinal and transverse directin are eqully important</td><td></td><td></td></tr>
<tr><td>Q.3
.</td><td>Attempt any TWO</td><td>2x8</td><td>16</td></tr>
<tr><td>a.</td><td>Construction:-
A SWR consists of
1. A core or heart:-
• It is generally made of hemp rope or coir rope.
• It acts as cushion
• It absorbs lubricant and acts as a reservoir
2. Strands
• It is designated by using two no’s “MxN” where M indicates no of strands and N indicates no. of wire in each strand.
• Three types of SWR.
1. Regular SWR
2. Flexible SWR
3. Extra Flexible SWR

<table>
<tr><th>No.</th><th>Type</th><th>Construction</th><th>Uses</th></tr>
<tr><td>1.</td><td>Regular SWR</td><td>6 x 7
6x12</td><td>It is used for rigging purpose, cargos etc.</td></tr>
<tr><td>2</td><td>Flexible SWR</td><td>6 x 19
6 x 24
6 x 30</td><td>Used for hoisting purose,towing ropes used in pulley etc.</td></tr>
<tr><td>3.</td><td>Extra Flexible SWR</td><td>6 x 37
6 x 61</td><td>Used for heavy duty load,cranes,brides.</td></tr>
</table>

Applications
• Ropes used for suspension</td><td>4m construction

2m application
2m specification
(1m per point)</td><td>8m</td></tr>
</table>

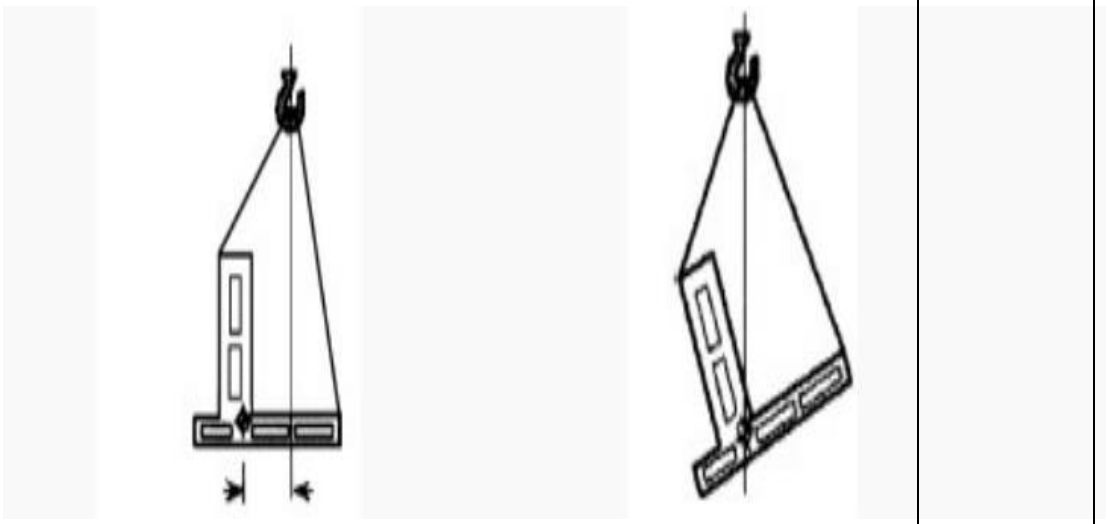
	• Used for lifting heavy loads • Used in cranes • Used in suspension bridges Specification It is designated by using two no's "MxN" where M indicates no of strands and N indicates no of wire in each strand for eg: 6x7 6= no of strands 7= no of wire in each strand		
b.	Various types of slings are: Based on materials used the slings are classified as • Manila sling • Wire rope sling • Steel chain sling Based upon the construction slings are classified into • Endless sling or gourmet • Choker sling • Double Choker sling • Bridle sling • Basket sling • Double Basket sling • Turn buckle sling	**4m for types** **2m for const.** **2m for merits and demerits**	**8m**

	 Double BASKETS SLING: The basket sling is similar to choker sling the only difference is that they are provided with a link that supports a flat surface.it is used in textile mills where handle of loads has to be lifted.If the sling has only on leg it is called as single basket and if the legs are more it is called as double baskets and so on depending upon the no.of legs Merits of slings • They are flexible straps • they support and raise the loads easily • they can be handled easily Demerits of slings • if the edges of loads are sharp it is can easily damage the slings • it has to be carefully used, stored and handled.		
c.	Precautions in Handling of loads on slings 1) Never use damaged or defective slings 2) Never use kinked sling 3) Never load slings in excess of rated capacities	**4m for factors** **4m for steps of estimation**	**8m**

	4) Balance loads in basket hitches to prevent slippage 5) Attach slings securely to the loads 6) In order to protect the slings from sharp edges, use rubber or leather pads 7) Keep suspended loads clear of obstructions 8) Keep the employees away from the loads when it is lifted or suspended Steps for Estimation of Gravity: 1) The point at which the weight of the body is said to be concentrated is known as its center of the whole body. 2) It is a point in any objects about which it is perfectly balanced, no matter how it is turned or twisted. 9) spended.	**(1m per point)**	
Q.4 a.	**Attempt any THREE**	**3 X 4**	**12**
i	<table><tr><td>Plain Lay Rope</td><td>shrewd lay rope</td></tr><tr><td>It is made by 3 strands lying together</td><td>It is made by 4 strands lying together</td></tr><tr><td>the core is not surrender by a braided shield</td><td>the core is surrender by a braided shield</td></tr><tr><td>It has higher no.of twists as compared to natural fiber rope.</td><td>It has less no. of twists as compared to natural fiber rope.</td></tr><tr><td>Not easy to handle handling in wet and dry condition</td><td>As compared to plain lay rope it has good flexibility and absorption, easy handling in wet and dry condition</td></tr><tr><td>It has less gripping power as compared to shrewd lay rope</td><td>It has more gripping power As compared to plain lay rope</td></tr></table>	**4m (1m per point)**	**4m**
ii	Spur Geared hoist:	**4m (1m per**	

	•This contains hand chains and load chain and train of gear assembled in a case. • The drive pinion that actuates the gear train is mounted ion the hand chain wheel valve shaft and gets its motion from the hand chain wheel ensures the holding of the load on its shaft to a friction brake assembly which ensures the holding of the load in the suspended position when there is no pull applied to the hand chain. •To lower the load chain the hand chain must be pulled continuously in the reverse direction. • This type of chain hoist is made with a capacity of 10T with a simple gear train. • Multiple gear trains gives a capacity of 50T or more. • These are most efficient manually operated hoist efficient more than 80% however they are costlier than other type.	**point)**	
iii	1.Personal Injury: Persona injury is a legal term for an injury to the body, mind or emotion, as opposed to an injury to property. 2.Property Damage: Property damage is damage or the destruction of public or private property. Caused either by a person who is not its owner or by natural phenomena	**2m for personal** **2m for property**	**4m**
iv	There are many material handling by lifting devices like 1)crane •A crane is a type of machine, generally equipped with a hoist rope, wire ropes or chains, and sheaves, that can be used both to lift and lower materials and to move them horizontally. •It is mainly used for lifting heavy things and transporting them to other places. **OR** 1) Hoist	**4m for any one device**	

	•A **hoist** is a device used for lifting or lowering a load by means of a drum or lift-wheel around which rope or chain wraps. •It may be manually operated, electrically or pneumatically driven and may use chain, fiber or wire rope as its lifting medium. •The load is attached to the hoist by means of a lifting hook.		
b.	**Attempt any ONE**	**6 x 1**	**6**
i	Hitches: Hitches are a type of knot used for binding rope to an object. It is used to fasten or tie, especially, temporally by means of a hook, rope, strip etc. Splices: It is a method of creating permanent loop in the end of multi stranded rope and are braided back into it's to form the loop. Three braids are minimum for NFR and five braids are necessary for SFR Inspection of hoisting chains: •As the length of the chain depends upon the purpose of its use, hence proper care should be taken of hoisting chain throughout its length. •Each and every link should be properly inspected at regular interval of time for any kind of damage •Proper lubrication of the chain should be conducted regularly •Any sign of rust the chain reduces the strength and hence it should be stored in cool and dry place in order to avoid rust.	**2m for hitches** **2m for splice** **2m inspection(1m per point)**	**6m**
ii	The pads are used in case of sharp edges for two main reasons. 1)To avoid damage to the rope in case of friction between the edges and rope 2) To avoid any kind of damage or deformation of the loads lifted. 3) Theses are basically used in order to protect the sling of steel wire rop from being weared out.	**3 m for uses(1m per point) and** **3m for adjust slings(2m for diag and**	**6m**

	4) They can be furnished of materials for eg: Rubber,leather etc. 5) If the material has sharp edges or bends.there is apossibilty of sling to get outcut or kinked 6) So,the sling must be wrapped around the edges by means of wooden blocking or corner saddles and if sharp edges are there,the sling are made up of flexible ropes. Adjust the sling length between hook and lifting lugs To adjust the sling length between hook and lifting lugs we should know were exactly the centre of gravity is located such that the equipment gets balanced while lifting. The diag shows the adjust the sling length between hook and lifting lugs. 	**1m for exp)**	
Q.5	**Attempt any TWO**	**2x8**	**16**
a.	Steel wire rope consists of two basic parts. 1. Core or heart 2. Strands. Depending on the no of strands SWR is divided into 3 main types. These types are selected according to the need and usage. 1. Regular SWR: This type of SWR is used for rigging purpose or in cargos	**8M (4M EACH)**	**8M**

	2. Flexible SWR: Used for hoisting purpose, towing rope, used in pulleys etc. 3. Extra flexible SWR: Used for heavy duty loads, in cranes, in construction and supporting bridges. The selection criteria for a SWR mainly depend upon the usage, purpose and availability of the material (grades of steel) used for preparing rope. Lubrication of SWR is done with help of core or heart. The core of SWR is made up of Natural fibre rope, generally hemp rope. It absorbs the linseed oil or other lubricants and acts as a reservoir with which the wire should be filled up-to saturation. Inspection of SWR: 1. Most difficult problem is deciding whether to discard the rope or not. 2. It is uneconomical to discard an expensive rope. 3. Careful inspection of strands 4. Construction & size of rope Counting the no of broken strands in the SWR.		
b.	Benefits of Accident prevention are as follows: 1. Greater job satisfaction & security 2. Work related injury will be reduced 3. Good plant location 4. Good management of safety on site 5. Good plant maintenance 6. Safe nature of work.	**1M EACH POINT**	**8M**
c.i	Importance of pressure vessels: 1. They are used to store & transmit liquid vapors & gases under	**4M**	

	pressure. Generally used to store liquid under pressure 2. Used in various operation ranging from industrial to domestic. 3. Other usages include nuclear plants, petro-chemical plants, mining industries etc. Method for Mounting of heat exchanger: Following are the steps involved in mounting heat exchanger. 1. Heat exchanger is a device built for efficient transfer of heat. 2. They are widely used in refrigeration, air conditioning, petro-chemical, natural gas processing unit etc. 3. Make sure that the heat exchanger is cleaned. 4. Inspect the exchanger for any residue or unwanted material. 5. Before placing the heat exchanger, the mountings are checked properly for any defects. 6. Foundation bolt, proper concreting and spirit level is required for mounting 7. Before working, inspect all the openings to remove all wooden plugs, shipping covers etc. 8. Do not expose the internal part of Exchanger to atmosphere as moisture may enter the unit & cause damage.		
ii	Difference between Boiler mountings and accessories. Boiler mountings are the fittings, which are mounted on the boiler for its proper and safe functioning. Though there are many types of boiler mountings yet following are important 1. Water level indicator 2. Pressure gauge 3. Safety valves	**4M**	

	4. Stop valve 5. Fusible plug Boiler accessories are the devices which are used as integral part of boiler and help in running efficiently. Though there are many types of boiler accessories yet following are important 1. Feed pump 2. Superheater 3. Economizer 4. Air pre-heater.		
Q.6	**Attempt any FOUR**	**4x4**	**16**
a	<table><tr><th>Synthetic fibre rope</th><th>Steel wire rope.</th></tr><tr><td>1. They are also known as artificial fibre rope. These are made up of synthetic fibres. 2. For construction; a. Plain lay b. Plaited type construction c. Braided type construction 3. Should not be exposed to sunlight to avoid deterioration due to UV rays 4. It can be stored for a long time as compared to SWR 5. Most of SFR stretch to about half of their original under loading before failure. 6. Inspection done for wear, fusion, stretching, cut etc.</td><td>1. This rope is made up of steel wires wound together. 2. A SWR is designated using 2 numbers. E.g. 6*7. The first number indicates no. of strand and the second number indicates wires in each strands. 3. It should be stored in cool and dry place free from moisture or heat to avoid corrosion. 4. It should be kept away from chemicals. 5. Should be coiled and stored. Proper oil or lubricant should be applied to avoid corrosion. 6. Inspection done for checking of broken parts, wire breaks, size etc.</td></tr></table>	**1M EACH**	**4M**
b	Pull lift chain hoist: 1. It is the simplest and most economical type of chain hoist in	**1M EACH**	**4M**

	operation. 2. It operates through a lever instead of hand chain. 3. It has ratchet for operating and holding the load avoiding the load to fall down. 4. Since the load is at the anchor hook of hoist it is not convenient for pulling loads. 5. It cannot be used where pulling is required e.g. removal of boiler tube, removing vehicle from mud etc. 6. It can be used for lifting loads varying between light to medium heavy.		
c	Good housekeeping involves every phase of industrial operations and should apply throughout the entire premises, indoors and out. It is more than mere cleanliness. It requires orderly conditions, the avoidance of congestion, and attention to such details as an orderly layout of the whole workplace, the marking of aisles, adequate storage arrangements, and suitable provision for cleaning and maintenance. A clean, well-ordered, attractive work environment sets the tone of your establishment. It encourages tidy work habits in employees. It helps reduce fatigue. It promotes good worker-management relations. It also gives a lift to morale, which is reflected in the quality of production and overall efficiency. Good housekeeping is also a good advertisement for your company. Customers and clients have more confidence in an organization when they we work being carried out efficiently in clean, pleasant, well-ordered surroundings.	**4M**	**4M**
d	Alignment of the pressure vessel is necessary because a slight variation in the position can damage the equipment of may affect the outcome of the vessel. Leveling operation in simple words is making sure that the pressure vessel is levelled in proper manner i.e. the position is upright or lay depending upon the need. Any adjustment in the leveling can be done by adding or removing the packing plates that are present at the foundation of the pressure vessel. Alignment is done prior to the placing of vessel. Proper dimensioning and distance is calculated then only the vessel is aligned with the foundation. Any change in leveling will affect in the change working of vessel. It may	**4M**	**4M**

	reduce the efficiency of pressure vessel.		
e	1. Make daily check on all lifting equipment. 2. Make daily checks on all lifting slings, check for fraying and kinking. 3. Check that all access equipment is in good condition, including scaffolding and ladders. 4. Check weather conditions, strong winds are dangerous during erection and sheeting. 5. Check for overhead electric lines before moving in with a crane. 6. Check that all erectors have the correct personal safety equipment, hard hats, boots, safety harness etc. 7. Check electric cables for hand tools, discard frayed or split cables. 8. Ensure that materials are correctly stored. 9. Ensure that there are sufficient guy wires on site for temporary bracing. 10. Ensure that erection always starts at a braced bay. 11. Ensure that permanent bracing and flange stays are installed as work proceeds. 12. Ensure that high strength bolts are used where indicated. 13. Ensure that high strength bolts are correctly tightened.	**1M EACH POINT**	**4M**
f	Proper Foundation during erection operation is important for alignment and leveling of the pressure vessels or boilers. The general procedure of foundation is as follows: Ground is first dug up similar to the one done before construction the only difference is the digging is done with dimensions and extra digging is avoided. The dimensions of the hole being dug are determined by the size of the equipment to be erected. After digging is done concreting is done which helps in leveling. This concreting is done keeping in mind that plates are to be placed in it. These plates vary in size and thickness. We can remove or add these plates in order to increase or decrease the height for leveling purpose. On these plates foundation bolt is fixed. The type and size of foundation bolt vary according to the equipment erected.	**4M**	**4M**