WINTER – 16 EXAMINATIONS

Subject Code: **17557** **Model Answer** Page No: ____/ N

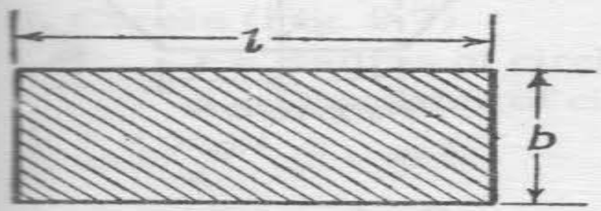
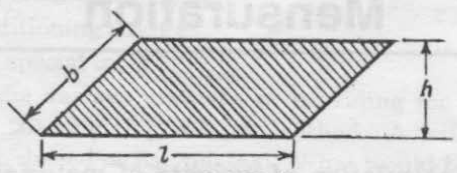
Important Instructions to examiners:

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.

WINTER-16 EXAMINATION

Model Answer Subject Code **17557**

`Q . NO.	MODEL ANSWER	MARKS	TOTAL MARKS
1.	**Attempt any FIVE of the following:**	**5*4M**	**20**
a)i	**Costing:** The technique and process of ascertaining costs. OR It is the determination of an actual cost of an article, after adding different expenses incurred in various departments. OR Costing is the classifying, recording and appropriate allocation of expenditure for the determination of the costs of products or services and for presentation of suitably arranged data for the purposes of control, and guidance of management.	**2M (any def.)**	**4M**
ii	**Overhaeads:** It is defined as the total cost of indirect materials, wages and expenses. OR It is defined the operating coss of a business enterprise which cannot be traced directly to a particular unit of output.	**2M (any def.)**	
b)	Following are the four causes of scrap:- 1) Due to Men: 1. Carelessness on the part of the operator. 2. Operator not trained properly. 3. Lack of attention on the part of the setter, inspector or supervisor. 4. Faulty instructions. 5. Written instructions and drawing misread. 2) Due to machines: 1. Plant and equipment in poor condition. 2. Design of plant and equipment may be poor. 3. Tools and gauges not standard one. 3) Due to material: 1. Materials not to the specifications. 2. Improper selection of materials. 4) Due to methods: 1. Improper techniques. 2. Poor works organisation.	**4M**	**4M**
c)	Efficiency and value of machine or asset reduces with the laps of time during use,which is known as Depreciation. It's Causes: 1) Depreciation due to wear and tear 2) Depriciation due to physical decay. 3) Accidential depreciation. 4) Depreciation due to deferred maintenance and neglect. 5) Inadequacy. 6) Depreciation by obsolescence	**2M(any def.)** **2M(any four points)**	**4M**

d)	List some functions of estimation department • to determine Material cost • to determine labour cost • to determine cost of tools, equipments etc. • to determine selling price after determination of all expenses. • to conduct time and motion study • to keep contact with other departments regarding methods of operations • to refresh themselves with modern methods and equipments in manufacturing. • to determine different overheads	**1M for each pt.**	**4M**
e)	**Rectangle:** **1. Rectangle (Fig. 9.1)** Let, l = length of rectangle b = breadth of rectangle Perimeter = $2(l + b)$ Then, Area = $l \times b$  RECTANGLE	**1M**	**4M**
	Parallelogram: **3. Parallelogram** (Fig. 9.3)  PARALLELOGRAM Fig. 9.3 Let, l = Length of one side of parallelogram b = Length of another side of parallelogram h = Height of parallelogram Then Area = $l \times h$ Perimeter = $2(l + b)$.	**1M**	

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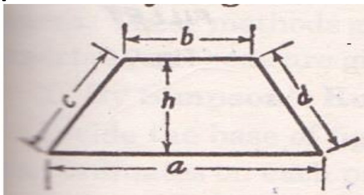
	Trapezium:  TRAPEZIUM Fig. 9.6 **7. Trapezium** (Fig. 9.6) Let a, b, c and d are the lengths of four sides. h = Perpendicular distance between parallel sides Perimeter $= a + b + c + d$ Area $= \left(\frac{a+b}{2}\right) \times h$	**2M**	
f)	• Shaping Operation E= (S/100)*N s= length of stroke N=cutting stroke per min. E=(3/5)*C C= Cutting speed $T = \frac{(L+5)(B+2.5)}{60\ CF}$ min. L = length of job B= width of job • Planning operation $T = \frac{(L+25)(B+5)}{K}$ min.	**2M each**	**4M**
g)	There is certain material which is lost during the forging operation on account of oxidation of metal and hammer blows which are termed as Forging Losses. Various forging losses are; 1) **Tong Loss.** While performing forging operations, some length of stock is required for holding the job in tong. This length is an extra length, which is removed after completion of the job. For estimation purposes, the weight of this extra length is also considered and is known as Tong loss. This loss may be taken as 2 to 3 cm of the stock length. 2) **Scale Loss.** The outer surface of the hot metal is generally oxidised, and when hammering is done oxidised film is broken and falls down in the form of scale. It reduces the dimensions of the job, and therefore, this loss must be considered for estimation purposes. Generally, it is taken as 6% of the net weight. 3) **Flash Loss**. It is the surplus metal, which comes out between the two meeting surfaces of the dies. The surplus material will be all around the periphery of the dies. For getting finished product, this surplus metal is required	**2M** **2M (any four)**	**4M**

	to be trimmed off. This loss may be calculated by assuming it to be 20 mm wide and 3 mm thick all around the periphery of the dies. Thus, volume of flash loss = Periphery x 20 x 3 cu mm nearly. 4) **Shear Loss**. The required sizes of workpieces for forging operations are obtained from long bars by sawing or shearing. In sawing operation, some material, is always lost. If last piece of bar is not to the required length, it is rejected. This loss of material is taken as 5% of the net weight. 5) **Sprue Loss**. The portion of metal between the length held in the tong and the material in the die is called sprue. This is also a metal loss and can be taken as 7% of the weight. Thus, we can Bee that nearly 15—20% of the net weight of metal is lost during forging. Therefore, in estimation their consideration is very essential and total weight will be net weight of job plus sum of the weight of different losses occurred during forging. Thus this gives the amount of weight of material required for forging.		
h)	Procedure of job order costing: Job order costing or job costing is a system for assigning manufacturing costs to an individual product or batches of products. Generally, the job ordercosting system is used only when the products manufactured are sufficientlydifferent from each other. In a job-order costing system, jobs are accounted for using the job-order cost sheet. The process involves the following steps: 1) Identification of the job 2) Tracing direct costs to the job 3) Identifying the indirect costs i.e. manufacturing overheads and finding the cost allocation base for each cost. 4) Applying the indirect costs to the job using the pre-determined allocation rate. 5) Finding total cost by summing up all the cost components. 6) Closing the under/over-applied manufacturing overheads to cost of goods sold/income statement. 7) Calculating revenue and profit	**2M** **2M**	**4M**
2.	**Attempt any FOUR of the following:**	**2*8M**	**16**
a)	Numerical: Volume of head $\frac{\pi}{6}h^2(3D-2h)$ h= 20mm D=2*28=56mm $\therefore Volume = \frac{\pi}{6} \times 400(3 \times 56 - 2 \times 20)$ $= 26.5\ cm^3$ Volume of Cylinder $= \frac{\pi}{4}D^2L$ $= 28.26cm^3$	**8M (2M for each step)**	**8M**

	Total Volume = 28.26+(26.5)*2 = 81.26 cm^3 Weight of one rivet $= \frac{81.26 \times 8}{1000}$ $= 0.65\ kg$ No. of rivets which can be manufactured from 4kg M.S. $= \frac{4}{0.65}$ $\sim 6\ rivets$		
b)	**Imporatnce of estimating.** i. To help factory owner in deciding manufacturing and selling policies. ii. To help in filling tenders. iii. To decide the amount of overheads iv. To decide about wage rates of workers after making 'time study'. v. It helps to decide whether a particular material should be purchased from the market or manufactured. **Estimating procedure.** Following are the steps. i.Production planning dept. decides the requirements and specification of products. ii.Production planning dept. makes drawings iii.To decide the accuracy and finish required iv.Prepare list of components v.To decide which component is to be manufactured or procured form outside vi.Determine the material cost. vii.Determine the time required by various dept. viii.Determine labor cost considering the wage rate allowed ix.Determine the prime cost x.Determine factory overheads xi.Determine administrative overheads. xii.Determine packing and delivery charges etc. xiii.Then calculate the total cost xiv.To decide the profit and add in total cost xv.To decide the discount allowed distributor xvi.To decide delivery time in consultation with production dept.	**4M (for importance)** **4M (for procedure)**	**8M**

c)	**Solution.** No. of products to be manufactured = 100 Direct material cost = Rs. 160.00 Direct labour cost = Rs. 200.00 Hence, Prime cost = Direct material cost + Direct labour cost = Rs. 160.00 + Rs. 200.00 = Rs. 360.00. **Ans.** As factory on-cost is 35% of the Prime cost. Factory on-cost $= \frac{360 \times 35}{100}$ = Rs. 126.00 Factory cost = Prime cost + Factory on–cost = Rs. 360 + Rs. 126 = Rs. 486.00. **Ans.** As overhead charges are 20% of the factory cost. $\therefore$ Overhead cost $= \frac{20 \times 486}{100}$ = Rs. 97.20 $\therefore$ Total cost = Prime cost + Factory on–cost + Overhead = Rs. 360 + Rs. 126 + Rs. 97.20 = Rs. 583.20 Now, management wants profit of 10% on the gross, *i.e.* total cost. Hence, Selling price of 100 pieces $= \frac{110 \times 583.20}{100}$ = Rs. 641.52 Hence, Selling price of each work piece $= \frac{641.52}{100}$ = **Rs. 6.4152** **Say Rs. 6.42. Ans.**	**8M**	**8M**

3.	Attempt any TWO of the following:	2*8M	16
a)	**Solution.** Material cost = Rs. 375 Labour cost = Rs. 245 Direct expenses = Rs. 80 **Overhead charges.** Factory on-cost of total labour cost = 150% $= \frac{150 \times 245}{100} = \text{Rs. } 367.50$ Hence total factory cost = 375 + 245 + 80 + 367.50 = Rs. 1067.50 Now, office on-cost is 30% of total factory cost $= \frac{1067.50 \times 30}{100} = \text{Rs. } 320.25$ Hence, total cost of production per 1000 bolts and nuts = Factory cost + Office on–cost = Rs. 1067.50 + Rs. 320.25 = Rs. 1387.75 ∴ Production cost per piece = 1.38775, say Rs. 1.39 per piece But selling price is Rs. 1.30 per piece. Hence the management is undergoing a loss of Rs. 1.39 – 1.30 = **Re. 0.09 per piece. Ans.**	8M	8M
b)	**Procedure of sheet metal shop estimation involves:** **i) Estimation of time:** Before proceeding to actual operation, strip is to be picked up, entered in the dies and process is started, these preparation items generally require 15 sec for small strips to 30 sec for heavy strips. This preparation time of 15 to 30 sec is equally divided among the blanks in each strip. Actual operations are generally performed on presses, either having automatic feeding arrangement or manual feeding. In automatic feeding all the strokes of the ram are utilized for blanking, while in hand feeding nearly 40% of the strokes are generally missed. After blanking operation is over 10 to 15 sec per strip are required for collecting the blanks and disposing the bridges, 10 to 15% of the total time, calculated as above, generally added, for fatigue and personal needs etc., to get estimated time. **ii)Estimation for inserting, piercing and ejecting, etc.:** After the blanks are prepared, each of the blanks is to be inserted in the press to get the desired shape. For inserting (also known as loading) a blank, estimated time is generally taken as : 2 to 5 sec for small components,	2M	8M

	6 to 8 sec for medium components (of size say between 25 cm x 25 cm to 50 cm x 50 cm) 8 to 10 sec for large size components. To pierce a hole in a component generally 2 sec are taken. Ejection or removal of the component after operation is over generally takes 10 sec, if it is done manually, and 2 sec if it is done on automatic machine. **iii)Capacity for Power press:** For capacity calculation purposes power presses can be divided into two categories: (i) The shaft of which is driven (by gearing or by belt) from one end; (ii) The shaft of which is driven from both the ends. For calculation of capacity of these presses following empirical relations are generally used: (i) When shaft is driven from both end: Maximum pressure available, in tonnes = 0.5 D^2 where, D is the crank pin dia in cm. (ii) When shaft is driven from one ends: Maximum pressure available, in tonnes = 0.75 D **As,** Shearing force required = Area to be sheared x Shearing stress. Hence, while procuring power press its crank pin dia must be decided and can be calculated by knowing the maximum shearing force required and using the above relations and putting the proper shearing stress of the material required to be used. Therefore, shearing stress for some of the important metals given here under: Aluminium =0.72 tonnc/cm^2 Mild Steel = 3.1 tonncs/cm2 = 6.7 Alloy Steel tonnes/cm^2 =0.3 Tin tonnes/cm^2 **Impotance of Blank Layout and their effects are:** i) Provides an outline of the object either on the sheet metal directly or firstly on paper which is then transferred to the sheet ii) Enables the ease of cutting in accordance to the outline prepared iii) Enables other operations like forming, assembling etc. to give required shape of the article iv) Helps to decide allowances to be provided for operations like raising, wiring, jointing, hemming, etc. v) For lot production, helps to decide width of strip to be cut vi) With help of patterns (templates), helps to evaluate an economical layout. vii) Helps, achieve economy in material use viii) Helps, achieve economy in labor employed	2M 2M 2M (any four)	

c)		8M	8M
	Diameter $D_1 = 45\,mm$ Diameter $D_2 = 42\,mm$. width of grinding wheel, $w = 20\,mm$ Cutting speed, $S = 16\,m/min$ depth of cut $= 0.3\,mm$. Length of stock $= 165\,mm$ Soln — Total stock to be removed $= \frac{45-42}{2} = 1.5\,mm$ Since depth of cut $= 0.3\,mm$, ∴ No. of cuts required $= \frac{1.5}{0.3}$ $= 5$ cuts [Time/cut $= \frac{\text{Length of cut}}{\text{Feed/rev} \times \text{rpm}}$] * Length of cut $= 165 + 5 = 170\,mm$ (where 5 mm is assumed for travel.) * Feed/rev $= \frac{w}{2}$ for rough grinding $= \frac{20}{2} = 10\,mm$ $S = \frac{\pi D N}{1000}$ $16 = \frac{\pi \times 45 \times N}{1000}$ ∴ $N = \frac{16 \times 1000}{\pi \times 45} = 113.18\,rpm$ ∴ Time required/cut $= \frac{170}{10 \times 113.18}$ $= 0.15\,min.$ ∴ Total time required for 5 cuts $= 0.15 \times 5$ $= 0.75\,min.$		

4.	Attempt any FOUR of the following:	2*8M	16
a)	**Welding:** It is the process of joining two or more metal pieces by heating them upto the desired temperature with or without the application of pressure and with or without the use of filler metal. **Gas Cutting:** It is the cutting of material with the help of gas flame. It is generally done with the help of oxy-acetylene flame. It can be done either by hand or by machine. **Various cost elements are as follows:** • Gas Cutting 1. Actual cutting cost 2. finishing cost 3. on-costs • Arc Welding cost 1. Material cost 2. Labour cost 3. Power charges 4. Finishing cost 5. On-cost	**2M** **2M** **2M Each**	**8M**
b)	**OPERATIONS IN SHEET METAL SHOP:** Following are the important operations and processes carried out in Sheet Metal Shop. **(i) Breaking out.** In this process, folds or ribbs in sheets, if any,are removed either with the help of beating the sheets by mallet or by passing the sheets through rollers. **(ii) Bending**. Bending is carried out for making cylindrical shapesfrom sheets. The length of sheet required for bending can be calculated as follows: Length for bending = 2 πr x (θ/360°) where r = radius of bend θO = angle subtended by bend through centre. **(iii) Turning up**. This process is done for making sharp bends to sheets for seaming, hemming etc. (iv) Hollowing. It is the pricess of beating the metal for giving it concave shape. This process is done over a hollow stake (Fig.).  Allowance for hollowing = $1/2(\text{Base})^2 + (\text{Height})^2$	**2M for each and explaina tion**	**8M**

(v) Raising. It is the process of beating the metal over a sp herica I hea.d Th is process gives a convex shape to the sheet metal. This process should be done on the sheets, having more than 20 gauge.

Allowance for raising = 1/2 $(Base)^2 + (Height)^2$.

(vi) Planishing. This is the process, which gives the final finish to the hollow or raised surfaces by removing minor bends. This is carried out by beating the sheet with the help of planishing hammer. Planishing hammer is a short hammer and has high polish.

(**vii) Edge Stiffening**. Whenever a sheet metal object is made, some type of edge must also be formed. No object is 'made without some short of edge to give the product a finished appearance, as well as edge eliminates the raw edge of the metal that is likely to cut some one and also provides additional strength for the edge. For edge stiffening following are the important ways:

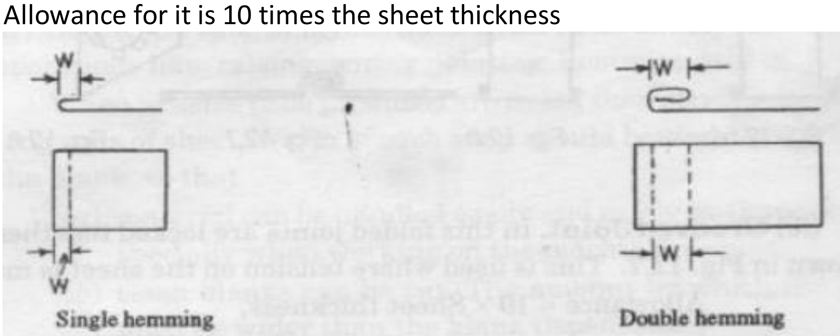
(a) Wiring. In this process, a wire is inserted at the edge of sheet metal articles. This wire adds in the stiffness of edge. Generally,wires used for the blank tin plated and G.I. sheets are of mild steel, copper and G.!. respectively.

Allowance for wiring= 2.5 x Dia of wire + 4 x Thickness of sheet.

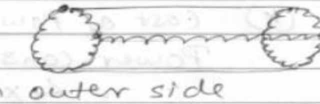
(b) False Wiring. This process is done like a wiring process but in the end wire is taken out so that its appearance is just like that as it has been wired, and therefore, known as False Wiring. In this process strength will be less as compared to wiring process.

Allowance = 2.5 x ilia of wire + 4 x Thickness of sheet.

(c) Hemming. In this process, edges of sheet are folded, when folding is doneonce as shown in Fig., it is called single hemming. The allowance for it is 4.5times the sheet thickness.When folding is done twice at the edges to give larger strength,as shown in Fig. , it is known as double hemming. Allowance for it is 10 times the sheet thickness



(**d) Flanging**. In this process, edge of the sheet is folded, at an angle of 90°, to give the shape of flange, as shown in Fig.

c)	Sol:-  Total length of weld on outer side = Length of weld on inner side. = Length of seam joint + Length of circular plates. = 3 m + 2×(π×1) m = 9.28 m ∴ Total length from outer & inner side = 2× 9.28 = 18.57m Labour charges = (One method)—as per given condition @ Rs. 20/m ∴ Labour charge = 20 × 18.67 = Rs. 371.4 × 5% = Rs. 389.97 Cost of electrodes = Length of electrode @ 1.5m/m weld = 1.5× 18.57 = 27.855m Discarded electrodes = 5%. = 27.855 × 1.05 = 29.25m ∴ Cost of electrode @ Rs 13 /m = 29.25×13 = Rs 380.25	**8M**	**8M**

(*) Cost of Power = 4 kWh/m

Power consumption @ ~~Rs. 4/kWh~~

= 4 × 18.57

= 74.28 kWh

Cost of power @ Rs. 4/kWh

= 74.28 × 4

= Rs. 297.12

(*) Overheads =

Overhead = 200% of prime cost

Prime cost = Rs. 389.97 + Rs. 380.25

= Rs. 770.22

∴ Overhead cost = 200% of 770.22

= Rs. 1540.44

∴ Total cost = Rs. 389.97 + 380.25 + 297.12 + 1540.44

= Rs. 2607.78

Note: if Rate of welding considered,

∴ Labour charges = inner side = 9.28 / 2

= 4.64 hr.

outer side = 9.28 / 2.5 = 3.712 hr.

∴ Labour charge @ Rs. 20/min = 20 × (8.352 × 60)

= 20 × 501.12 =

= Rs. 10,022.4 × 5%

= Rs. 10523.52

Total cost = Rs. 10523.52 + 380.25 + 297.12 + 1540.44

= Rs. 12741.33

5.	Attempt any TWO of the following:	2*8M	16
a)	**Estimation of Net Weight** For estimation of net weight of the forged component, following procedure is adopted: (a) Break up the job drawing into suitable geometrical sections,whose volumes can easily be calculated by using mensuration. (b) Next, find the volume of each section, neglecting rounded corners and taking suitable assumptions. (c) Now, find total volume of material required by subtracting the volume of the hollow spaces. (d) Lastly, calculate the weight of the component by multiplying the total volume with its density.	2M	8M
	Estimation of Losses . Certain amount of material is lost during different forging operations. The exact estimation of losses is very difficult, but by practical experience, the losses can be calculated during forging as accurate as possible. Various losses in forging are : (i) Tong Loss. While performing forging operations, some length of stock is required for holding the job in tong. This length is an extra length, which is removed after completion of the job. For estimation purposes, the weight of this extra length is also considered and is known as Tong loss. This loss may be taken as 2 to 3cm of the stock length. (ii) Scale Loss. The outer surface of the hot metal is generally oxidised, and when hammering is done oxidised film is broken and falls down in the form ofscale. It reduces the dimensions of the job, and therefore, this loss must be considered for estimation purpose.Generally, it is taken as 6% of the net weight. (iii) Flash Loss. It is the surplus metal, which comes out between the two meeting surfaces of the dies. The surplus material will be all around the periphery of the dies. For getting finished product, this surplus metal is required to be trimmed off.This loss may be calculated by assuming it to be 20 mm wide and 3 mm thick all around the periphery of the dies. Thus, volume of flash loss = Periphery x 20 x 3 cu mm nearly. (iv) Shear Loss. The required sizes of workpieces for forging operations are obtained from long bars by sawing or shearing. In sawing operation, some material, is always lost. If last piece of bar is not to the required length, it is rejected. This loss of material is taken as 5% ofthe net weight. (v) Sprue Loss, The portion of metal between the length heldin the tong and the material in the die is called sprue. This is also a metal loss and can be taken as 7% of the weight. Thus, we can see that nearly 15-20% of the net weight of metal is lost during forging. Therefore, in estimation their consideration is very essential and total weight will be net weight ofjob plus	4M	

	sum of the weight of different losses occurred during forging. Thus this gives the amount of weight of material required for forging. **Estlmation of Time** Estimation of time required in forging is very difficult and only practical experience it can be ascertained, which is also not satisfactory, since it varies from worker to worker depending on their skill. However, time required can be divided into following two categories: (i) Heating the job upto the required temperature. (ii) Performing the operation to get the required shape. These timings are with normal working on anvil and hammer	**2M**	
b)	The following are thecharacteristics of process cost accounting: 1.The output consists of product which are homogenous. 2. Production is carried on in different stages (each of whichis called a process) having a continuous flow, 3. Production takes plae continuously except in case where the plant and machinery are shut down for maintainace etc. Output is uniform and all unit are identical during each process. It would not be possible to trace the identity of any particular lot of output to any lot of input. 4. The input will pass througn two or more processes before it takes the shape of the output. The output of each process becomes the input for the next process until the final product is obtained,with the last process giving the final product. 5. The output of a process (except the last) may also be saleable in which case the process may generate some profit. 6. The input a process (except the first) may be capable of being acquired from the outside sources. 7. The output or a process is tranfered to the next process generally at cost to the process. It may also be transferred at market price to enable checking efficiency of operation in comparsion to the market conditions. 8. Normal and abnormal losses may arise in the process. **Material costing:** It involves ascertaining all the expenses incurred on materials, starting from purchase to the time till the material is ready for issue. These expenditures may include; i) Cost of material purchased ii) Procurement cost iii) Inventory carrying cost iv)Material handling cost v) Material loss vi)Indirect expenses vii) Scrap and surplus **Overhead costing:**	**4M (any four)** **2M**	**8M**

All expenses other than direct material and labor that occur in a concern are called expenses. These are of two types; Direct and Indirect expenses. The indirect expenses are called Overheads or On-cost that may be classified as –
i) Factory expenses,
ii) Administrative expenses and iii) Selling and
distribution expenses. Most of these overheads are found out from various records, but some charges require good knowledge and experience of the estimator. Some such charges are;

- Depreciation
- Obsolescence
- Interest on capital
- Idleness
- Repairs and maintenance

2M

c) At the job site, the main function of the erection team is to receive the components, store them, protect them from damage, preserve them during storage to sustain the original condition and assemble them with the permissible limit/tolerance specified in the standards handbooks to achieve determined performance during operation. Around 5600MT of pressure parts components per unit are dispatched loose to the job site by road/rail. Hence, it becomes all the more important for the job site erection team to take utmost care right from the receipt stage to completion of erection, so that commissioning activities proceed without any difficulties. A project gets completed successfully only when the 3 M's viz. Men, material and machines/devices associated with it are well co-ordinated and accounted for. Hence, elements for costing involves;

8M

2M

i) The machines/devices associated during a typical erection work are listed below for reference which may be fully owned by the concerned party but are usually preferred on hire basis

S. No.	Description
1.	Electric winch 10 ton capacity (for drum)
2.	Electric winch 3 or 5 ton capacity (for U rod)
3.	Wire Ropes 1400 M length, 25 mm dia. 6 x 37 construction IWRC and right lay (for Drum)
4.	Wire rope 400M length, 19 mm dia. 6 x 37 construction, IWRC and right lay (for U rod)
5.	10 sheeve 100 ton pulley block
6.	Single sheeve 10 ton pulley block
7.	3 ton or 5 ton chain pulley block
8.	3 ton pulling and lifting machine
	Or
9.	Wire rope 26 or 28 mm dia. 6 x 37 construction and IWRC. a) 40 mm length for lashing 10 sheeve pulley with cat band structure b) 80 M length for lashing 10 sheeve pulley with drum.
10.	Forged steel bull grips to suit the dia. Of rope

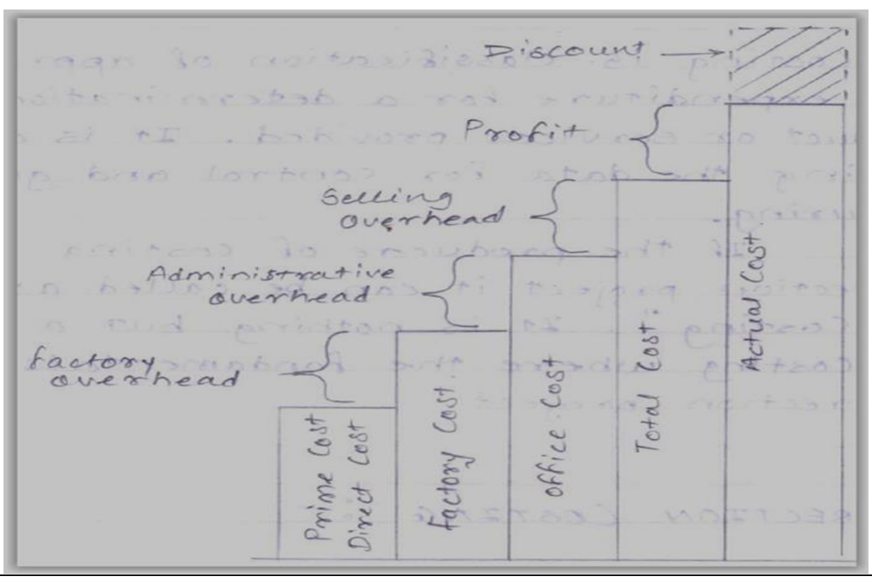
2M

ii) The men in the team may comprise of technical officers of the parent company but third party expertise (on contract basis) may also be utilised along with in house and other contract labour as listed below:

S. NO.	CATEGORY
1	Fitters
2	Riggers / Khalasi
3	Welders
4	Tack – Welders
5	Grinders
6	Gas Cutters
7	Electricians
8	Helpers
9	Radiographer

2M

The material viz. the pressure vessel concerned may be required to be prepared for erection phases viz. Hauling, hoisting, etc. for which additional components may be needed and attached as per on site conditions in addition to such similar functional parts provided on the vessel during fabrication stage. With this knowledge the stages of erection could be pre planned and applying the basics of costing the cost estimation may be forecast for the above erection project. The figure next shows the basic **cost elements** associated in estimation costing problems.



2M

6.	**Attempt any TWO of the following:**	**2*8M**	**16**
a)	A good wage or incentive aystem should have the following characteristic: 1) This should guarantee an adequate minimum day-wage. 2) It must have the free consent of the workers. 3) It must reward the worker according to his capacity and merit. 4) It must be simple in its working so that it may be readily understood by the workers. 5) It must not involve heavy clerical work and thereby in- crease the ultimate cost. 6) It shouid aim at increasing production without adversely affecting quality. 7) It should reduce wastage of material and careless use of plant, tools and equipment. 8) It ahould have effective supervision but it should not be too heavy. 9) Incentive, bonus etc., ahould be payable along with wages and not put off for future. 10) The syatem should be fair both to the employers and employees.	**8M (any eight)**	**8M**
b)	Soln – C = Rs. 1,50,000 S = Rs. 25,000 N = 6.5 yrs. Since depreciation is calculated at the end of the year in the Sum of the Year ~~Average~~ Digit method. Therefore, N = 6 yrs. ∴ C − S = 150,000 − 25,000 = Rs 1,25,000. Sum of the year = 1+2+3+4+5+6 = 21 Depreciation for 1st year. $= \frac{6}{21} \times 1,25,000$ = Rs. 35,714.29 Depreciation for 2nd year $= \frac{5}{21} \times 1,25,000$ = Rs. 29,761.9 Depreciation for 3rd year $= \frac{4}{21} \times 1,25,000$ = Rs. 23,809.52 Depreciation for 4th year $= \frac{3}{21} \times 1,25,000$ = Rs. 17,857.14	**8M**	**2M**

c)	Turning is operation of metal removal in which job is rotated against a tool. Let S= Cutting speed in mlmin. D = Dia of job to.,he turned in cm. N =.Revolution of the job/min. and F = Feed/rev and S=πDN / 100 m/min N=100S/πD rpm as we know that feed/mon = rpm x feed/rev.and time taken to turn unot length=1/(Feed/min) min therefore time taken to turn L metre length = L/(feed/min)= L/(feed/rev x rpm) hence T= length of the job to be turned/(Feed/rev. x rpm) there for T= L/(F x N) min	**4M**	**8M**
	The other time considerations are: 1. Turning 2. Knurling, 3. Facing, 4. Drilling, 5. Boring, 6.Reaming, 7. Threading, 8. Tapping, 9. Milling, 10. Grinding, 11.Shaping, 12. Planning In addition to this machining time (also known as operation time), following time considerations are taken: (i) Setting up the job and tool or cutters. (ii) Setting up the machine, (iii) Inspection of job. (iv) Fatigue allowance. (v) Tool changing and sharpening time. (vi) Machine cleaning and servicing time. (vii) Personal allowance.	**4M (for any four points)**	