WINTER – 14 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.

Q. NO.	MODEL ANSWER	MARKS	TOTAL MARKS
1.	**Attempt any FIVE of the following:**		20
a)	Costing has been defined by the Institute of Cost and Works Accountants, England as : "The technique and process of ascertaining costs", Wheldon has defined costing as : "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". It is the determination of an actual cost of an article, after adding different expenses incurred in various departments. It may also be defined as the system, which systematically records all the expenditure to determine the cost of manufactured products. The important aims and objects of costing are: (i) To determine the cost of each article. (ii) To determine the cost incurred during each operation, to keep control over worker's wages. (iii) To provide information to ascertain the selling price of the product. (iv) To supply information for detection ofwastages. (v) It helps in reducing the total cost of manufacture. (vi) It suggests, changes in design, when the cost is higher. (vii) To help in formulating the policies for charging the prices of the products. (viii) To provide information for economic consideration for purchasing new machines. (ix) To help the management in decision-making, (x) To facilitate preparation of estimate for submitting in tenders or quotations. (xi) To compare the actual cost with the estimated cost of the component.	2m (any 2 defn.) 2m (any 4 objects.)	4m
b)	To find out the cost of the materials issued from the stores on demand is called valuation. AVERAGE PRICE METHOD: In this method avg. cost of the material is charged for the product. The two methods commonly used are; i) Simple average method – It means the avg. cost of material in hand on the date of issue from stores. Each time, when the material is issued, avg. cost is calculated. Therefore, new calculations are necessary after every entry to obtain the mean price. Application eg.	0.5m 1m 1m	4m

Date	Receipts			Issues			Balance		
	Quality	Rate Rs.	Amount Rs.	Quality	Rate Rs.	Amount Rs.	Quality	Rate Rs.	Amount Rs.
Jan1	-	-	-	-	-	-	100	1.00	100
Jan3	200	1.00	200	-	-	-	300	1.00	300
Jan6	-	-	-	250	1.00	250	50	1.00	50
Jan9	200	1.25	250	-	-	-	250	120	300
Jan 22	-	-	-	150	1.20	180	100	1.20	120

OR

ii) Month end average method – In this method avg. cost of each type of material is calculated at the end of each month and is charged for all the issues during the following months. — 1m

Application eg.

Average of previous months .....Rs.1.10 per unit

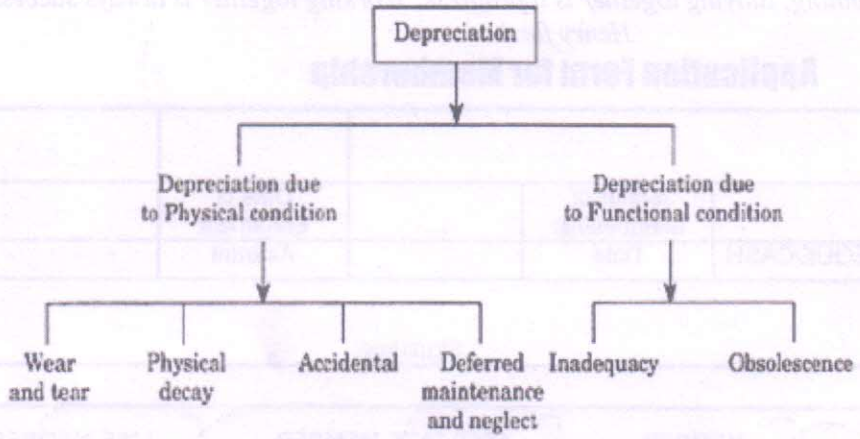
Date	Receipts			Issues			Balance		
	Quality	Rate Rs.	Amount Rs.	Quality	Rate Rs.	Amount Rs.	Quality	Rate Rs.	Amount Rs.
Jan1	-	-	-	-	-	-	50	1.10	55
Jan6	100	1.00	100	-	-	-	150	-	155
Jan 10	-	-	-	100	1.10	110	50	-	45
Jan 14	-	-	-	30	1.10	33	20	-	12
Jan 19	300	1.20	360	-	-	-	320	-	372
Jan 23	-	-	-	200	1.10	220	120	-	152
Jan 26	-	-	-	70	1.10	77	50	-	75

1m

FIXED PRICE METHOD:

In this method, issued material is charged at a predetermined estimated price, for a fixed period. Mostly for one year one rate is charged. Therefore, receipts and issues are recorded in quantities only which make store keeping easy. This method is also known as "Standard Price" method. Price is generally fixed on the basis of past experience and future trends. — 1m

Application. This system is mostly used where the fluctuations in the market price are very less and few. — 0.5m

c)	Whenever, any machine or equipment perform us ful work, its wear and tear is bound to occur, This can b minimi ed upto some extent by proper care and maintenance but can't be totally eliminated. Its efficiencyalso reduces with the lapse of time and at one time it becomes uneconomfcal to be used further and needs replacements by another new unit. Therefore we can say that efficiency and value of machine or a set reduces with the lap e of tune during use, which i known as Depreciation'.  	2m (Defn.) 2m (diagm.)	4m
d)	i) He must be able to read and understand drawings and blue prints well. ii) He must have good knowledge of different machines, their operations and operation timings for the products being manufactured. (iii) He should have a good knowledge for the use of proper tools, jigs and fixtures etc. (iv) He must have good knowledge of market prices of different materials required in the manufacture. (v) He must have good knowledge about the wage rates of all types of workers. (vi) He should have good knowledge about different allowances for time, i.e. personal allowance, fatigue allowance, tool changing allowance, grinding allowance and checking allowance etc. (vii) He must have good knowledge about the cutting speeds, feeds and depth of cuts for different materials, operations and different types of tools. (viii) He must be a well qualified and trained technical person and must be able to suggest new methods of production to reduce the production cost. (ix) He must know official account classification. (x) He must know the procedure for conducting "Time and Motion Study". (xi) He should also have good knowledge about the business matters. (xii) He must co-operate with other departments, specially with production, design, planning and sales departments.	4m (any 4 points)	4m
e)	N = 4 holes d = 20 mm = 2 cm ; D = 20 mm = 2 cm		

	$S = 21.8$ m/min ; $F = 0.2$ mm/rev $= 0.02$ cm/rev Time for drilling one hole; $T = \frac{d}{F \times N} = \frac{20\text{ mm}}{0.2\text{ mm/rev} \times N\text{ rpm}}$ Now, $N = \frac{1005}{\pi D} = \frac{1000(21.8)}{\pi(20)}$ $= 346.96$ rpm ≈ 347 rpm $\therefore T = \frac{20}{0.2 \times 347} = 0.288$ min./hole $\therefore$ Time to drill 4 holes $= 0.288 \times 4$ $= 1.153$ mins.	1m 1m 1m 1m	4m
f)	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; etc. (i) Tong Loss: While performing forging eperatiens, 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. (ii) Scale Loss : The outer surface ofthe 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 dimension of the of the job and therefore this loss must be considered for estimation purposes. 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 perlphery of the dies. Thus,volume of flash loss = periphery x 20 x 3 cumm nearly. (iv)Shear loss: The required sizes of workpieces for forging operation 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 lengh, it is rejected. This loss of material is taken as 5% of the net weight. (v)Sprue loss: The portion of metal between the length held in the tong and materal in the die is called sprue. This is also a metal loss and can be taken as 7% of the weight.	2m 2m (any 4)	4m

	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 of the job plus sum of the weight of different losses occurred during forging. Thus this gives the amount of weight of material required for forging.		
g)	The following seven steps approach is used to assign actual costs to individual jobs; i. Identify the chosen cost object(s). ii. Identify the direct costs of the job. iii. Select the cost-allocation base(s). iv. Identify the indirect costs associated with each cost-allocation base v. Compute the rate per unit of each cost-allocation base used to allocate indirect costs to the job. vi. Compute the indirect costs allocated to the job. vii. Compute the cost of the job by adding all direct sand indirect costs assigned to it	4m	4m
2.	**Attempt any TWO of the following:**		**16**
a)	1 batch = 100 pcs. of product Direct material cost = Rs. 2100 Direct labor cost = Rs. 2500 } Per batch Direct expenses = Rs. 2400 } ∴ Direct / Prime costs = Rs. 7000 per batch 2m Factory overheads = $\frac{80}{100}$ (Direct labor cost / batch) ∴ " = Rs. 2000 per batch 2m Factory costs = (Direct cost + Factory overheads) per batch ∴ " = Rs. 9000 per batch 2m ∴ Factory cost per product = $\frac{9000}{100}$ ∴ " = Rs. 90 2m		8m
b)	1 lot = 2000 bolts & nuts Per lot cost estimates are :–		

	Direct material cost = Rs. 7500 Direct labor cost = Rs. 0300 + Rs. 1200 | Rs. 1500 + Rs. 1000 + Rs. 0750 + Rs. 0500 + Rs. 0450 | Rs. 2700 Total direct labor cost = Rs. 4200 Direct expenses = Rs. 750 Therefore, direct/prime costs = Rs. 12450 Factory overheads = $\frac{150}{100}$ (1500) + ∴ " $\frac{100}{100}$ (2700) ∴ " = Rs. 4950 Factory costs = Direct + Fact. overheads ∴ " = 12450 + 4950 ∴ " = Rs. 17400 Office costs = $\frac{20}{100}$ (Factory costs) ∴ " = 0.20 (17400) ∴ " = Rs. 3480 Packing & transptn. = Rs. 500 ∴ Total cost of lot = Rs. 21380 ∴ Total cost per bolt & nut = Rs. 10.69 Selling price per bolt & nut = Rs. 15.00 ∴ Profit earned per piece is by amt. Rs. 4.31	1m 1m 2m 2m 2m	8m
c)	The importance of estimating is as given below: In all organisations, before starting actual production or filling up the tenders, estimation is done. Therefore; accurate estimating is very necesary	4m	8

	to compete in the market and to be sure whether manufacture of a particular article will be profitable or not. Both over and under estimating are dangerous. Over-estimating leads to increase the cost and hence tender may not get suitable response.Under-estimating may lead to heavy losses to the concern. Hence accurate estimating is very essential and) therefore, staff of the estimating department must be well qualified, experienced and trained in this profession. For example, a concern wants to start the manufacturing of Lathe-chucks.The firm finds through market survey that its marketprice is approximately Rs. 1500. But estimated price for the manufacture is more than this value. Then the drawings may be sent back to design section, to find out an alternate design, so that price can be reduced, If reduction of price is not possible then idea of manufacturing the chucks would be dropped otherwise it would lead to a great loss, Estimating procedure is laid down here under: i. Production. planning department decides the requirements and specifications of the product. ii. Production planning department makes out the drawings; lays down the method and sequence of operationsmachines to be used, rates allowed to the labour in consultation with the TIme and Motion Study Department and wages department. iii. To decide accuracy and finish required. iv. To prepare a list of the component of the product. v. To decide which component can be manufactured in the concern itself and 'which should be procured from outside. vi. Determine the material cost by calculating the quantities vii. Determine the time required on various operations by using calculation methods or by time and motion study and adding suitable allowances. viii. Determine labour cost considering the wage rate allowed for various categories of operators and other workers employed for manufacturing the product. ix. Determine the prime cost after adding direct expenses in the direct material and direct labour costs. x. Determine the factory overheads including depreciation and expenditure on maintenance of the plant, insurance,power etc. xi. Determine administrative overheads considering the policy of the concern for calculating these expenses (i.e. by percentage or by hourly rate or by unit rate), xii. Determine the packing and delivery charges etc. xiii. Then to calculate the total cost. xiv. To decide profit and add in-the total cost, in order to fix up the sale price. xv. To decide the discount allowed to distributor.	4m	

	xvi. To decide delivery time in consultation with the production department and sales department.		
3.	**Attempt any TWO of the following:**		**16**
a)	Vol. of segment of sphere $= \frac{\pi}{6} h^2(3D-2h)$ $\therefore$ " $= \frac{\pi}{6}(20)^2(3\times56-2\times20)$ $\therefore$ " $= 26808.26\ mm^3$ Total vol. of segment of sphere $= 26808.26 \times 2$ $= 53616.52\ mm^3$ Vol. of central portion $= \frac{\pi}{4} d^2 \times l$ $= \frac{\pi}{4}(30)^2 \times 40$ $= 28274.33\ mm^3$ Therefore, total vol. of w/p $= 81890.85\ mm^3$ $\therefore$ Weight of w/p $= \left[\frac{8}{1000} \times \frac{1}{1000}\ kg/mm^3\right] \times 81890.85$ $\therefore$ Weight of w/p $= 0.655\ kg$ Available raw matl. of MS $= 4\ kg$ $\therefore$ No. of rivets that can be made ≈ 6	2m 2m 2m 2m	8m
b)	Length of cut, $L = 160\ mm$ $D_I = 42mm$ to $D_f = 40mm$ $w = 20mm$; $S = 16\ m/min$; depth of cut $= 0.25mm$ Now, total stock to be removed $= \frac{42-40}{2}$ $= 1\ mm$ But, depth of 1 cut $= 0.25mm$ $\therefore$ No. of cuts reqd. $= 4$ cuts	 2m 2m	8m

	Time/cut = $L/F \times N = L+0.5/F \times N$ (assuming, 0.5cm over-travel) Feed/rev = w/2 for rough cut = 20/2 = 10 mm/rev. ← 2m $\therefore N = 1005/\pi D = 1000 \times 16/\pi \times 42 = 121.26$ rpm $\therefore T = 0.136$ min/cut. Hence for 4 cuts; $T = 0.545$ min. ← 2m		
c)	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 the dies andprocedss is started,these preparation itemsa generally require 15sec for small stripes to 30sec for heavy strips.This preparation time of 15 to 30sec os equally divided among the balnks in each strip. Actual operations, are generally performed on presees, either having automatic feeding arrangement or manual feedmg. In automatic feeding all he strokes of the ram are utilised 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% calculated as above, generally added, for fatigue and personal needs etc.to get esttmated time. ii) Estimating for inserting, piercing, ejecting, etc. After the blanks are prepared each of the balnks 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. 6 to 8 sec for medium components(of size say between 25 cm X 25 cm to 50cm x 50cm) 8 to 10 sec for large size components. To pierce a hole in acomponent generally 2 sec are taken.Ejection or removal of the component after operation is over generally takes 10sec. If it is done manually and 2sec if it is done on automatic machine. iii)Capacity for Power press: For capacity calucation purpose power presses can be divided into two categories: (i) The shaft of which is driven (by gearing or belts)from one end; (ii)The shaft of which is driven from both the ends. For calucation of capacity of these presses following empirical relation are generally used: (i) When shaft is driven from both ends. Maximum pressure avaible in tonnes = $0.5D^2$ Where D is the crank pin dia. in cm (ii)When shaft is driven from one ends: Maximum pressure avaible in tonnes = $0.75\ D^2$ As shearing force required + Area to be sheared X Shearing stress.	2m 2m 2m	8m

	Hence,while procusing power press ots cranks pin dia must be decied and can be calculated by knowing the maximum shearing force required and using the above relation and putting the proper shearing stress of the material required to be used. Therefore,shearing stress for some of the important metak given hereunder: Aluminium =0.72 tonnes/cm^2 Mild steel = 3.1 tonnes/cm^2 Alloy steel = 5.7 tonnes/cm^2 Tin = 0.3 tonnes/cm^2 Importance 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 (any 4)	
4.	**Attempt any TWO of the following:**		**16**
a)	Capacity for Power press: For capacity calucation purpose power presses can be divided into two categories: (i) The shaft of which is driven (by gearing or belts)from one end; (ii)The shaft of which is driven from both the ends. For calucation of capacity of these presses following empirical relation are generally used: (i) When shaft is driven from both ends. Maximum pressure avaible in tonnes = $0.5D^2$ Where D is the crank pin dia. in cm (ii)When shaft is driven from one ends: Maximum pressure avaible in tonnes =$0.75\ D^2$ As shearing force required + Area to be sheared X Shearing stress. Hence,while procusing power press ots cranks pin dia must be decied and can be calculated by knowing the maximum shearing force required and using the above relation and putting the proper shearing stress of the material required to be used. Therefore,shearing stress for some of the important metak given hereunder: Aluminium =0.72 tonnes/cm^2	2m	8m

	Mild steel = 3.1 tonnes/cm^2 Alloy steel = 5.7 tonnes/cm^2 Tin = 0.3 tonnes/cm^2 It is generally expressed in terms of Tonnage of a Press as shown from an eg. below; To determine the tonnage capacity for cutting a rectangular blank of size a X b cm^2 from MS plate of thickness, t cm by using a press having D cm diameter pin, we have; Pressure required to cut the rectangular blanks = Area to be sheared * Shearing stress of MS = 2(a + b) * t * Shearing stress of MS = X tonnes Second similar example:	3m 3m	
b)	Factors affecting the welding costs are: There are certain factors which affect largly on the welding cost. These factors are being discussed below: i) Time required for handling and settin the job and equipment in correct position ii) Time required for fixing the fixtures. iii) Rest and fatigue time alloance.These are generally taken as 5 to 10% of the toatal time for which an operator remaina engaged. iv) Excessive welding- it increase the cost of welding. v) When excessive current is used,welding cost also increase. Factors affecting the welding cost estimations are: (a)Preparation Cost: It includes the cost of edge preparation proper fit up and other elements beforeactual starting of welding. (b) Actual Welding Cost: This includes two costs. (i) Cost of material used in welding process like O_2, C_2,H_2 filer rod,and flux etc. . (ii) Labour Cost - It will be obtained from wages sheets. (c) Welding finishing Cost - This includes, the expenditure made for finishing the welding joint after welding. Post welding treatment (such as heat treatment)cost can also be taken into account. (d) On-cost - All the other overheads an the equipment and other facilities connected with welding operation are considered under on cost heading. Gas welding costs may be estimated similar to the gas cutting by considering the following cost elements; (i) Actual Cutting Cost. This includes; (a)Cost of material used in cutting preeees, like cost of oxygen acetylene etc. (b) Labour cost. (ii) Finishing Cost - This is the expenditure made on finishing and cleaning in cut parts.	3m (any 3) 3m (any 3) 2m	8m

(iii) On- Costs - Theseare the other overhead charges made on equipment and other items which arc connected with cutting processes.

c)

L = Longitudinal seam = 2.5 m
d = 1m ; t = 15mm (MS Plates)
Total weld run on outside = $2.5 + 2\pi d$
$= 2.5 + 2\pi(1)$
$= 8.783$ m
Total weld run on inside = 8.783 m
Total weld run = $2 \times 8.783 = 17.57$ m
Time for welding 8.783 m;
on outside = $8.783/2.5 = 3.51$ hours
on inside = $8.783/2 = 4.39$ hours
Labour charge = Rs. 16 per metre
∴ For 2 m = Rs. 32 on inside
& For 2.5m = Rs. 40 on outside
i.e. Per hour rates on inside & outside will be = Rs. 32 & Rs. 40 respectively
∴ Labour charges are;
For outside : $3.51 \times 40 =$ Rs. 140.40
For inside : $4.39 \times 32 =$ Rs. 140.48
∴ Total labour charges are;
For outside : $140.40 \times 1.05 =$ Rs. 147.42
For inside : $140.48 \times 1.05 =$ Rs. 147.50
∴ LABOR CHARGES = Rs. 294.92 — 4m

Now,
Length of electrode reqd. = 1.5 m/m weld
$= 1.5 \times (17.57)$
$= 26.355$ m
Electrodes consumed = $26.355 \times 1.05 = 27.67$ m — 1m
(5% discarded electrodes) ∴ Cost of electrode = Rs. 332.04

Power consumed = 4 KWh for 1m of weld
∴ For 17.57m of weld, power consumed is = 70.28 KWh
Power charges = Rs. 3 per KWh
∴ Cost of power = Rs. 210.84 ← 1m

8m

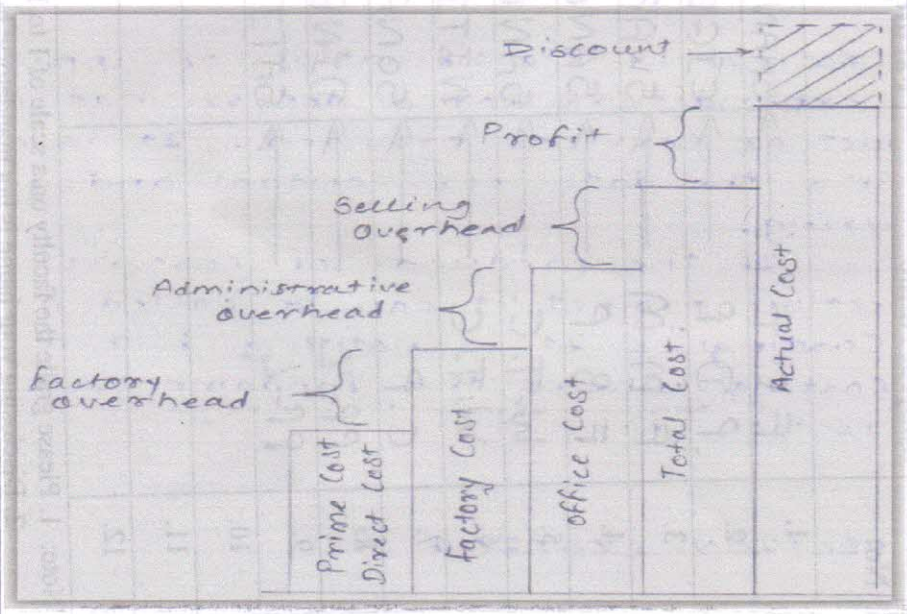
	Overheads = $\frac{200}{100}$ (Prime cost) = 2 (294.92 + 332.04 + 210.84) = Rs. 1675.6 Total electric welding cost = 837.8 + 1675.6 ∴ " = Rs. 2513.4	1m 1m	
5.	**Attempt any TWO of the following:**		**16**
a)	At the job site, the main function of the erection team is to receive the components, store them, 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; 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	2m	8m

Sr.no	Description
1.	Electric winch 10 ton capacity (for drum)
2	Electric winch 3 or 5 ton capacity (tor 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 mtn dia. 6 x 37 construction. IWRCand right lay (tor U rod)
5	10 sheeve 10 ton pulley block
6	Single sheeve 10 ton pulley block
7	3 ton or 5 ton chain pulley block
8	S ton pulling and lifting machine
	Or
9	Wire rope 26 or 28 mm dia. 6 x 37 construction and IWAC. a) 40 mm lenglh for lashing 10 sheeve pulley with cat band structure b) 80 M length tor lashing 10 sheave pulley with drum.
10	Forged steel bull grips to suit the dia. of rope

	11 | Etc.			
	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:		2m	

Sr.No	CATEGORY
1	Fitters
2	Riggers /Khalasi
3	Welders
4	Tack - Welders
5	Grinders
6	Gas Cutters
7	Electricians
8	Helpers
9	Radiographer
10	Etc.

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



2m

b)	Process Costing Method is appicable where the output result from a sequence of continuous or repetitive operation or process and products are	4m (any 4)	8m

	identical and cannot be segregated. Process costing enables the ascertainment of cost of the product at each process or stage of manufacture. The following features may be identified with process costing: 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	2m	
	Overhead costing: 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	2m	

	• Interest on capital • Idleness • Repairs and maintenance		2m
c)	Volume of square bar = $30 \times 30 \times 250 = 225000\ mm^3$ = Total available volume Scale loss volume = $\frac{8}{100}$ (Total) $= 18000\ mm^3$ $\therefore$ Vol. of sq. bar − Scale loss vol. = Vol. of hexagonal bar i.e. $225000 - 18000 = V_{hex.bar}$ $\therefore V_{hex.bar} = 207000\ mm^3$ $\therefore \frac{3\sqrt{3}}{2}(15)^2 \times l = 207000$ $\therefore$ Length of hexagonal bar after considering scale loss $= \frac{207000 \times 2}{3\sqrt{3}(15)^2}$ $= 354.11\ mm$	2m 2m 2m	8m
6.	**Attempt any TWO of the following:**		**16**
a)i)	Although estimating and costing both are required to decide the price of the product, even then the two are different as explained below: 1. Estimation is aimed to calculate the probable cost of the product before the manufacturing starts, and while costing is the determination of actual cost of the product by adding various elements of expenses incurred. 2. Estimation requires a highly technical know ledge hence an estimator is basically an engineer and costing requires the knowledge of accounts and, therefore, costing is done by accountants. 3. Estimation forecasts about the probable cost and hence one can know before the manufacture that the manufacturing of the product shall be profitable or not, and whether one should manufacture it or not, but	2m (any 2)	8m

	costing tells after the manufacture about the profitability of the product. 4. Estimation is about forecasting or predicting the probable cost of a product whereas costing is the ascertainment of actual cost incurred.		
ii)	Following terms are important to consider wastage control in the industry: i)Obsolete ii)Surplus iii) Scrap Control over Obsolescence: Problem of obsolescence can be controlled to be a great extent by analysing the stores items as per F.S.N (fast moving,slow moving and non moving) classification. Slow and non moving costly items need immediate action. Some of the actions suggested are: 1. All pending orders of costly,slow and non moving items be cancelled. 2.Real insurance items only one set per machine,be identified and reatained and rest be disposed off with the consent of user department. 3.Buy – back clauses in the purchase contract should be made operative i.e. such parts be resold to the manufacturers. 4.Tranfer the items to other units of the enterprise,if such items can be used by them, 5. Sale of such items to other companies. 6. Utilise obsolele items after reclaiming them. Control of Surpluses: 1. All pending orders of identified surplus items be cancelled. 2. Follow the steps as suggested for "Control over obsolescence" Control ot Scraps The amount of scrap as a percent, of the total production is a measure of the working efficiency of the personnel connected with the production. Therefore, waste and scrap should be periodically analysed, the reasons thereof should be found and necessary steps be taken to reduce the incidence of wastes. Steps should be taken through brain storming sessions to reduce wastage by changing the size of raw materials (sheets, rods, angle iron etc) and adopting some changes in production methods etc.	2m (any 4) 2m 2m	
b)	C = Rs. 1,00,000 ; S = Rs. 20,000 ∴ C − S = Rs. 80,000 N = Useful life = 6 years Now, Sum of digits of years will be = 1+2+3+4+5+6 = 21		

	Now, depreciation charges each year is found as follows :- Depr.^{n} charges for 1st year $= \frac{6}{21} \times 80,000$ $= Rs.\ 22857.14$ Depr.^{n} charges for 2nd year $= \frac{5}{21} \times 80,000$ $= Rs.\ 19047.62$ Depr.^{n} charges for 3rd year $= \frac{4}{21} \times 80,000$ $= Rs.\ 15238.09$ Depr.^{n} charges for 4th year $= \frac{3}{21} \times 80,000$ $= Rs.\ 11428.57$ Therefore, at the end of 4th year, the depreciation fund in reserve works out to be $= Rs.\ 68571.42$	2m 2m 2m 2m	8m
c)i)	Importance of mensuration: For correct calculation of weights of material, an estimator should have good knowledge of mensuration. With the knowledge of mensuration an estimator calculates areas, volumes, weights and hence determines cost of material (i.e. with the available on going rate/kg for that material) Therefore, careful study of mensuration is essential and the estimator should always remember the concerned formulaes to arrive at the material cost because experience has shown that material cost is about 25% to 65%	4m	8m

of the total production cost.

ii) Machine time calculation for turning operation: 4m

It is operation of metal removal in which job is rotated against a tool.

Let S = Cutting speed on m/min

D = Dia of job to be turned in cm

N = Revolution of the job/min.

F = feed/rev.

	Operation (Cutting speeds are in m/min)							
Matl	Turning and boring	Drilling	Reaming	Treading	Tapping	Milling	Shaping slotting,and planing	Grinding
Aluminium	300	120	120	30	45	200	25	20
Brass /Gun metal	50	50	25	30	20	40	12	22
Mild steel	30	25	12	25	5	20	20	15
Cast iron	20	15	10	20	7	50	10	12
Cpper	30	50	15	30	20	40	10	22

$S = \pi DN/100$ m/min

Therefore, $N = 100S/\pi D$ rpm

As we know that feed/min = rpm X Feed/rev and Time taken to turn unit 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 job to be turned/(feed/rev X rpm)

i.e. T = L / F X N min