PROCESS PLANNING AND COST ESTIMATION

(ME8793)

QUESTION BANK

UNIT I INTRODUCTION TO PROCESS PLANNING

Introduction- methods of process planning-Drawing interpretation-Material evaluation – steps in process selection-.Production equipment and tooling selection

PART –A

1. Define – Process Planning. (May/June 2009)

Process planning has been defined as the sub-system responsible for the conversion of design data to work instruction. Process planning can also be defined as the systematic determination of the methods by which a product is to be manufactured economically and competitively. It consists of devising, selecting and specifying processes, machine tools and other equipment to convert raw material into finished and assembled products.

2. What are the functions of process planning? (May/June 2009)

The systematic determination of the engineering processes and systems to manufacture a product competitively and economically is a called operation planning. It is the stage between design and production. The plan of manufacture considers functional requirements of the product, quantity, tools and equipment, and eventually the costs for manufacture.

3. What are the information required to do process planning? (Nov/Dec 2012)

(a) Quantity of work to be done along with product specifications.
(b) Quality of work to be completed.
(c) Availability of equipments, tools and personnel.
(d) Sequence in which operations will be performed on the raw material.
(e) Names of equipment on which the operations will be performed.
(f) Standard time for each operation.
(g) The time of operations will be performed.

4. What is sequencing? (Nov/Dec 2012)

Sequencing is one of the process planning activities in which the order of the manufacturing process is decided based on various factors.

5. Write the approaches of process planning. (May/June 2010,2013)

The two general-approaches to process planning are
(a) Manual process planning, and

(b) Computer Aided Process Planning (CAPP).
(i) Retrieval CAPP system, and
(ii) Generative CAPP system.

6. Define – Manual Process Planning. (May/June 2013)

In traditional process planning systems the process plan is prepared manually. The task involves examining and interpreting engineering drawings, making decisions on machining processes selection, equipment Selection, operations sequence. and shop practices. Therefore, the manual process plan is very much dependent on the skill, judgment and experience of the process planner.

7. What is a route sheet? (Apr/May 2008)

The route sheet lists the production operations and associated machine tools for each component and subassembly of the product

8. What are the material selection parameters? (May/June 2009)

1. Function 2.appearance 3.reliability 4.service life 5.Environment 6.Compatibility

9. What are the factors should be considered for process and equipment selection?

While selecting a process or equipment, the following factors considered
Economic-considerations
Production rate and unit cost of production.
Quality and reliability aspects. Lower process rejection.
Minimum set-up time.
Longer productive life of machines or equipment. Functional versatility *ie.*, ability to perform. more than one function.

10. What are the stages of machine selection process?

Stage 1: First cut selection
Stage 2: Power/ force analysis
Stage 3: Capability analysis
Stage 4: Operational analysis

PART –B

1. Explain the basic steps of the design and development of a new product approach for material selection process. **(May/Dec 2011)**

2. Explain the basic steps to the material selection process and stages of material evaluation procedure in detail? **(May/Jun 2013)**

3. Explain process planning activities in detail and documentation involved in preparation of process plan.
   (Nov/Dec;2007,2011.May/Jun2009,2010,2012,2013)

4. What do you undrestand by capp?Explain in detail about the types CAPP and mention the benfetis of CAPP.**(Apr/May 2008,Nov/Dec 2012, Nov/ Dec 2015)**

5. What are the benefits of simplification and standardization?

6. What are the set of documents required for process planning?

7. Explain the various machine selections and Tooling selection method in detail. **(May/june2001)**

8. Explain the various Process Selection Methods and general guide lines for process sequencing. **(Nov/Dec2012)**

9. Describe various approaches to process planning.

10. Explain the use of computers in process planning and cost estimation and list out the advantages of CAPP.

11. Explain the main functions of Product design and manufacture and its interface in detail? **(Nov/Dec2012)**

UNIT II PROCESS PLANNING ACTIVITIES

Process parameters calculation for various production processes-Selection jigs and fixtures election of quality assurance methods - Set of documents for process planning-Economics of process planning- case studies

PART –A

1. **What you mean by break-even point? (April/May 2009)**
   The ***break-even point*** may be defined as the level of sales at which total revenues and total costs are equal. It is a point at which the, profit is zero.
   It is also known as "no-profit ***no-loss point".***
   If a firm produces and sells above the break-even point, it makes profit. In case it produces and sells less than the breakeven point, the firm would suffer losses.
   Management can change the break-even point by changing fixed cost, variable-cost and selling price.

2. **How does the fixture differ from jig?**
   Fixture only holds and positions the work, but doesn't guide the work piece

3. **Identify and describe the four basic elements of a work holder.(Nov / Dec 2009)**
   Clamping elements, locating elements, tool guiding and setting elements

4. **What is meant by cutting speed? (April/May 2015)**
   It is defined as the relative speed between the tool and work piece. It is also known as surface cutting speed or surface speed

5. **What are the main process parameters that can influence the success of the machining? (Nov / Dec 2010)**
   Cutting speed, feed rate, depth of cut

6. **What is meant by a feed rate? (April/May 2012)**
   Feed rate is the speed at which the cutting tool penetrates the work piece

7. **What is the function of work holding device?**
   The main function of any work holding device is to position and hold a work piece in a precise location while the manufacturing operation is being performed.

8. **How jigs are classified?**
   Jigs can be classified broadly in to two types based on the manufacturing process involved as: 1.Drill jigs 2. Boring jigs

9. **Define Quality Assurance. (April/May 2011)**
   QA methods/inspection criteria for the entire critical processing factor such as dimensional, geometric tolerances and surface finish specification that are identified during the drawing interpretation, processes and manufacturing.

10. **What is meant by statistical quality control? (Nov / Dec 2014)**
    SQC is about employing inspection methodologies derived from statistical sampling theory to ensure conformance to requirements.

11. **What do you understand by break-even Analysis? (April/May 2015)**
    Break-even Analysis, also known as Cost-volume-Profit analysis, is the study of Inter-relationships among a firm's sales, Costs and Operating profit at various levels of output.

12. **List any four factors to be considered for selection of measuring instruments. (Nov / Dec 2010)**
    Accuracy, Linearity, Magnification, Repeatability

PART –B

1. The fixed costs for a factory for the year 2009-2010 are Rs.1,50,000 and thee variable cost is Rs. 10 per unit produced. The selling price per unit is Rs.25. calculate the break –even quantity.
2. (1)Explain the Break Even analysis in detail with derivation

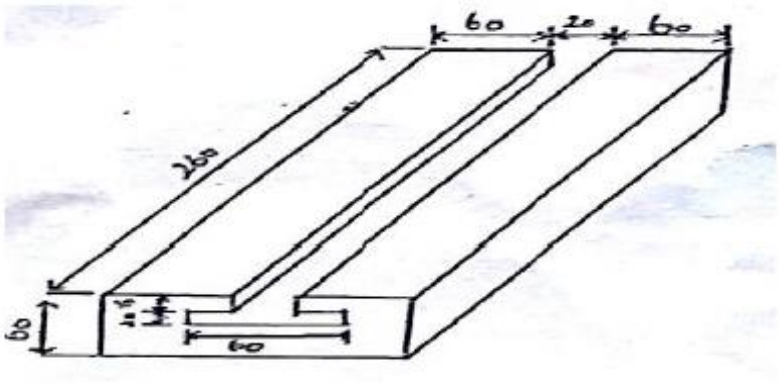
   (2) A component can be produced with equal case on either a capstan lathe or on a single spindle cam operated automatic lathe. Find the break even quantity QE if the following information is known. Capstan lathe automatic lathe

1	Tooling cost	Rs. 40.00	Rs. 40.00
2	Cost of cams	-------	Rs. 150.00
3	Material cost/components	Rs. 0.32	Rs. 0.32
4	Operating labour cost	Rs. 2.50 /hour	Rs. 1.36 /hours
5	Cycle time/component	6 minutes	2 minutes
7	Setting up labour cost	Rs. 4.00/hours	Rs. 4.00/hours
8	Setting up time	1.5 hours	8 hours
9	Machine overheads	300 % of (d)	950 % of (d)
	(Setting and operating)		

(Nov / Dec 2015)

3. A 25 cm× 10 cm C.I surface is to be faced on a milling machine with a cutter of diameter of 15 cm and 16 teeth. If the cutting speed and feed are 55 m/min and 6 cm/min. respectively, determine the rpm of the cutter, feed/tooth and the milling time. **(Nov/Dec 2015).**
4. Calculate the machining time required to produce one piece of the component shown in fig starting from 25 mm bar. The following data is available.
   a. For turning:
   b. Cutting speed =40 m/min
   c. Feed -0.4 mm/rev
   d. Depth of cut =2.5 mm/per pass
   e. For thread cutting:
   f. Cutting speed =8 m/min

5. A T-slot is to be cut in C.I slab as shown in fig. given below. Estimate the machining time. Take cutting speed 25 m/min, feed is 0.25 mm/rev. Dia of cutter for channel milling is 80 mm.



6. What are all the process planning parameter of production processes. Explain in detail about the principles and practice of location and clamping in jigs and fixtures

7. An inserted tooth face milling cutter has 8 teeth. It is to be used to mill a surface using a spindle speed of 1250 rpm and a feed rate of 0.3mm/tooth. Calculate the feed rate in m/min

8. A planer is capable of 15 strokes per minute over a stroke length of 2m. The cutting time ratio for the machine is 4:3. Determine cutting speed. The feed per stroke fs is quoted as 2 mm/stroke. What is the feed rate fm in mm/min ?

9. Explain the marginal costing in detail.

10. Calculate the maximum surface speeds for facing, turning all surfaces and parting off. The maximum spindle speed of the lathe being used is 600rpm for the part diagram that shown in figure

UNIT III INTRODUCTION TO COST ESTIMATION

Importance of costing and estimation –methods of costing-elements of cost estimation –Types of estimates – Estimating procedure- Estimation labour cost, material cost- allocation of over head charges- Calculation of depreciation cost

PART –A

1. **Define Cost estimation.(Nov/Dec2012)**
   The process of determining the probable cost of the product before the start of its manufacture.

2. **Define Costing.(Nov/Dec 2012, May/June 2013)(April/May 2015) (Nov/Dec 2015)**
   Costing is the determination of an actual cost of a component after adding different expenses incurred invarious departments.

3. **List a few objectives of the cost estimation? (May/June 2012) (April/May 2015)**
   (a) To establish the selling price of a product for. a quotation or contract, so as to ensure reasonable profit to the company.
   (b) To determine the most economical process, tooling.
   (c) To prepare production budget.
   (d) To evaluate alternate designs of product.

4. **What are the functions of cost estimation? (May/June 2013)**
   (a) Cost estimates are required to submit accurate tenders for getting the contracts.
   (b) Cost estimates are required for the manufacturer to choose from various methods of production the one which is likely to be most economical.
   (c) Cost estimates are required for fixing the selling price of a product.

5. **What is meant by conceptual cost estimating? (Nov/Dec 2014)**
   It is defined as the forecast of project costs that is performed before any significant amount of information is available from detailed design.

6. **What do you mean by a realistic estimate.(Nov/Dec 2011)**
   Three possible estimates are over estimation, Under-estimation, and Realistic estimation.Both the over estimation and underestimation are dangerous because both will ultimately lead the enterprise to failure. In over

estimating, the firm will not be able to compete with its competitors who estimated the price correctly and will loses the order to its competitors. In case of under estimating, the firm will face huge financial loss which may utter failure or closure of firm. Therefore a realistic estimation is the need of the hour for any concern.

7. **Define parametric estimating**. **(Nov/Dec 2012,2014) (May/June 2012)**
   It is an estimating technique that uses a statistical relationship between historical data and other variables to calculate an estimate for activity parameters, such as scope, cost, budjet and duration

8. **Define Batch costing? (April/May 2015)**
   Batch costing is a form of job costing. In this method, instead of costing each batch of components separately, each batch of components is taken together and treated as a job.

9. **What do you mean by multiple cost method?(Nov/Dec 2012 ,2013)**
   This method is used in firms which manufacture variety of standardised products, having no relation to one another in cost, quality and the type of.process, *etc*.

10. **What is meant by direct material cost? (May/June 2012, May/June 2013)**
    Direct material is one which becomes a part of the product. It is the material which is consumed in the, manufacturing of product. It can be measured and charged directly to the cost of the product.

11. **What is meant by overhead expenses? (May/June 2012)(April/May 2015)**
    Overhead expenses are those which cannot be charged directly to a particular product manufactured. All expenses other than the direct material cost, direct labour cost, and direct expenses are known, as over head costs or indirect expenses. Administrative expenses, selling and distribution expenses are added to the over head costs. The overhead costs may be estimated by referring to the records of overhead costs in similar parts produced in past.

12. **Define prime cost. (Nov/Dec 2009)**
    Prime cost also known as direct cost consists of direct material costs, direct labour cost and direct expenses.

13. What are the components of a job estimate? (Nov/Dec 2012)

Before doing the cost estimation of a product, one should know the constituents of estimation.design cost, R & D cost, labour cost, drafting cost, materials cost, inspection cost, cost of tools, jigs andfixtures, and overhead cost.

14. Define – Design Cost. (Nov/Dec 2012)

The cost of design of a product is estimated by ascertaining the expected time for the design of that product. Estimated design cost = Estimated design time x Salary of designer per unit time. The design time can be estimated on the basis of similar products already designed in the past or on the basis of good judgment of designer. If the design of the product is done by some outside agency, the total amount paid to outside agency gives the cost of design.

15. Define – Depreciation due' to Physical Decay. (May/June – 2010)

There are certain items or equipments of a factory which do not have motion but get decay because of climatic and atmospheric effects.

16. What is meant by Depreciation due to Accident? (May/June -2009)

We know that in spite of a number of precautionary measures, sometimes accidents may occur in the industry due to hazard and facility operations. This may cause damage to the machines, plants, buildings, vehicles or such other fixed assets. The loss in the value of the asset mainly due to undesirable, uncontrollable and unforeseen accidents is" known as depreciation due to accidents.

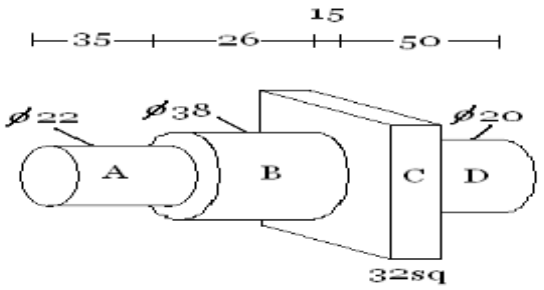
17. Define – Factory or Works Cost. (Nov/Dec -2010)

It consists of prime cost and factory expenses. Factory cost = Prime cost + Factory expenses

PART –B

1. Explain in detail about the types of estimates and how it is done? **(Nov/Dec 2015)(April/May 2015)**
2. List and explain in detail about the components of a job estimate**?(Nov/Dec 2012, Nov/Dec 2013) (May/Jun 2013)**
3. Explain the step by step cost estimation procedure in detail. **(Nov/Dec 2012)(April/May 2015)**
4. List and explain in detail about the objectives of cost accounting? **(Nov/Dec 2015)**
5. What are the methods of costing? Explain in detail. **(May /June 2012, May/Jun 2013)**
6. Write down the step by step procedure for estimating the direct material cost. **.(April/May 2015)**
7. Name the various elements of cost.Explain each element in detail with examples**.(April/May 2015)**

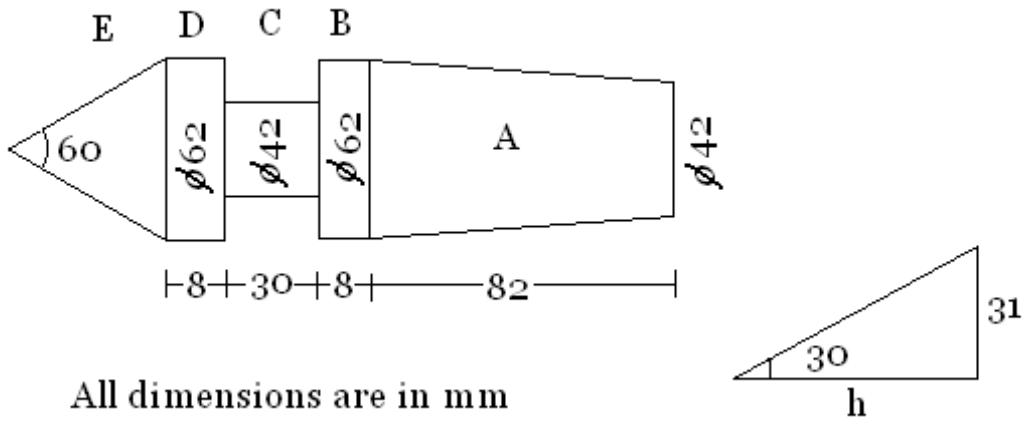
8. An isometric view of the work piece is shown in figure. What will be the weight of the material required to produce it. The density of material is 2.681gm/cc. Find also the material cost, if its rate is 13.60 per kg.



All dimensions in mm

9. The dimensioned figure shows a lathe centre. Estimate the weight and cost of material for the same, if the material weighs 7.868 gm/cc density and the

material cost is Rs11.45 per kg.



10. What is meant by analytical estimating? Write its procedure, advantages, limitations and applications. **(Nov/Dec 2013)**

11. Explain about allowances in cost estimation. **(May /June 2012 Nov/Dec 2015)**

12. A certain piece of work is produced by a firm in batches of 100. The direct material cost for that 100 workpiece is Rs. 160 and the direct labor cost is Rs. 200. Factory on cost is 35% of the total material and labour cost. Overhead charges are 20% of the factory cost. Calculate the prime cost and factory cost. If the management wants to make a profit of 10% on gross cost, determine the selling price of each article.

13. Describe the various methods of allocation of overhead expenses**?(Nov/Dec 2012)**

14. What are the types of estimates? (ii) Differentiate between estimating and costing**.(May/Jun 2013) (Nov/Dec 2015)**

15. What are the three methods used in conceptual cost estimation? Explain any two methods briefly. **(nov/dec 2014)**

16. Explain the various time allowances which should be considered for calculating labour cost. **(May/Jun 2013)(April/May 2015)**

17. Explain the procedure followed for estimating the cost of an industrial product. **(May/Jun 2013)**

18. A manufacturer is making 100 units of an item per hr and incurs the following expenses:
Direct Material cost Rs 35
Direct labour cost Rs 200
Direct Expenses Rs 75
Factory on cost 150% of labour cost
Office on cost 30% of factory cost
Find out the selling price for a profit of 15% on the selling price. ?(Nov/Dec 2015)

19. The direct material used is Rs.1000 and direct wages of Rs.443 for the manufacture of certain items. Calculate factory cost (i) when the on-cost is to be 60% of prime cost,and (ii)When the on-cost is to be 90% of direct productive labour cost.

UNIT IV PRODUCTION COST ESTIMATION

Estimation of Different Types of Jobs - Estimation of Forging Shop, Estimation of Welding Shop, Estimation of Foundry Shop

PART –A

1. **Write the formula for flash loss. (Nov/Dec 2013)**

   Flash loss = (Volume of flash) x (Density of the material)
   Volume of flash = (Circumference of component at parting line) x (C/S area of flash)
   Cross sectional area of flash= Flash thickness x Flash width

2. **What is Flash loss?**
   When dies are used for forging , certain quantity of material comes out of the die at the parting line of the top and bottom halves of the die. This surplus wastage material is called flash loss

3. **What are the various types of forging?**
   Hot forging is performed on the metal above the recrystallisation temperature
   Cold forging is performed on the metal below the recrystallisation temperature

4. **What are the various losses associated with forging?**
   Shear loss, Tonghold loss, scale loss, Flash loss, Spruce loss.

5. **Contrast smith forging with drop forging.**
   If the metal is heated in a smithy and forged using forging tools manually or using hand, then this type of forging is known as hand forging or smith forging.
   Drop forging utilizes a closed impression die to obtain the desired shape of the component .

6. **Define – Shear Loss.(May/June 2013)**
   The blank required for forging a component is cut from billets or long bars, by means of a sawing machine. During sawing, the material equal to the product of thickness of sawing blade and cross section of bar is lost for each cut. This material loss is known as shear loss.

7. **Define – Scale Loss. (May/June 2012)**
   As the workpiece in high temperature during the forging processes, the oxidation of the outer surface of the workpiece will take place. That is, the heated workpiece reacts with oxygen from air forms a thin film of iron oxide on the outer surface of the wokpiece. This thin film of iron oxide is called scale.

8. **Define – Inadequacy. (May/June 2008)**
   Sometimes the existing machine is functioning well, but it is not capable of coping with the increased demand. Because of the increased demand, that particular machine becomes inadequate.

9. **Define –TongholdLoss**. (Nov/Dec 2011)
   While performing some forging operations, some length of the stock (at one end) is required for holding the stock in tong. This small extra length will be removed after completion of the work piece. This loss is known as tonghold loss. Therefore this tonghold loss should be added while calculating the required stock material.

10. **A butt joint between two square metal plates of 250 x 250 cm is made using electric arc welding. If the rate of welding is 5metre/hr, calculate the time required to complete ten such welding operations.** (Apr/M ay 2006)
    Soln:
    Time required fro making 10 welds = (1/rate of welding) x (Length of weld) x (10)
    = (1/5)x 2.5 x 10
    = 5 Hrs or 300 mins.

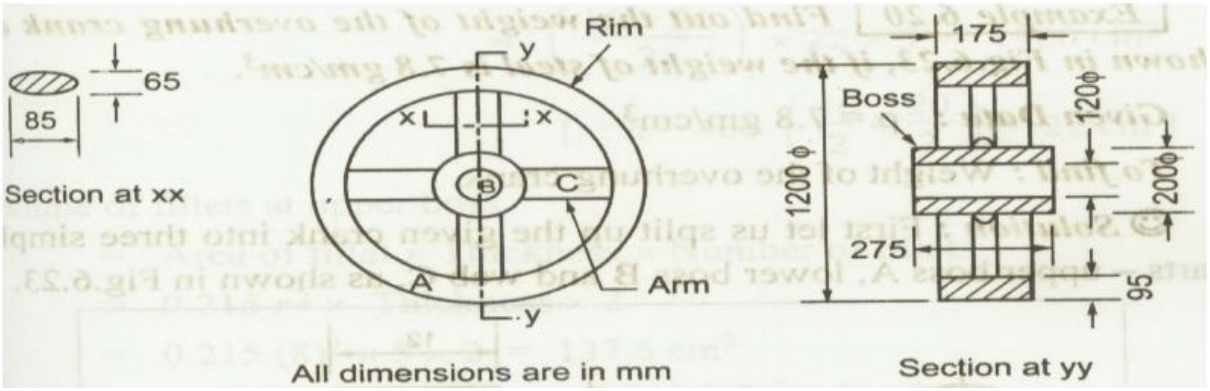
11. **List the various allowances provided to the pattern.**
    Shrinkage allowance, Draft allowance, Machining allowance, Distortion allowance, Shake allowance.

12. **What are the various losses considered while calculating direct material cost for a casting? (Apr/May 2010)**
    While calculating the gross weight of the costing, add
    i) The weight of the process scrap (about 15 to 20% of the net weight) i.e., weight of the runners, gates, risers etc., consumed as apart of process in getting the costing

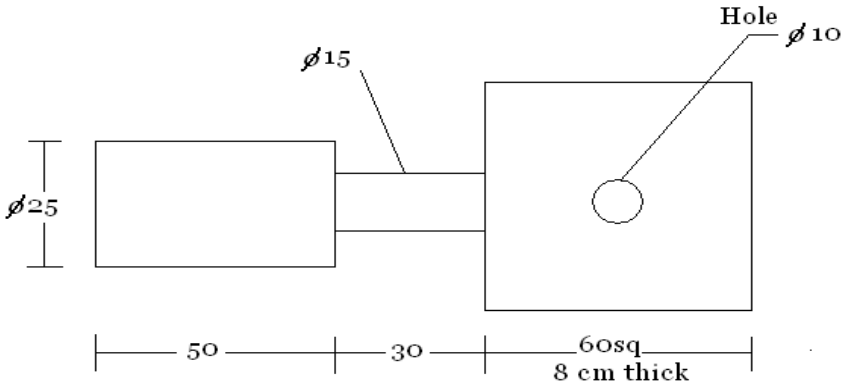
ii)the weight of the metal cost in oxidation (about 8 to 10% of net weight in costing) in furnace and in cutting gates, spills, over arm etc., Which is not recoverable

PART –B

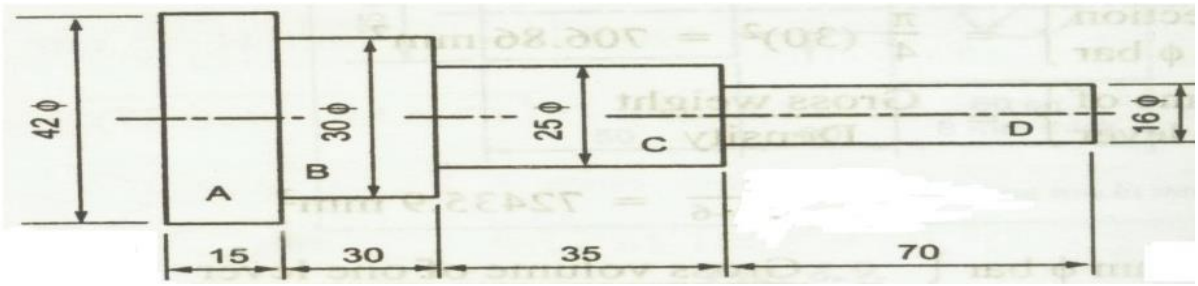
1. A gas engine flywheel is shown in figure. Determine the weight of the flywheel if the material weighs 7.2 g/cc.



2. Calculate the net weight and gross weight for the manufacture of 500 levers shown in figure. The material weighs 7.8 g/cc and the total losses account for 25% of net weight of the lever. Also calculate (i) length of 3 cm diameter required per component (ii) the cost of forging 500 pieces if material cost Rs. 8 per kg, labor costs Rs. 1.20 per piece and overheads are 25% of material cost.

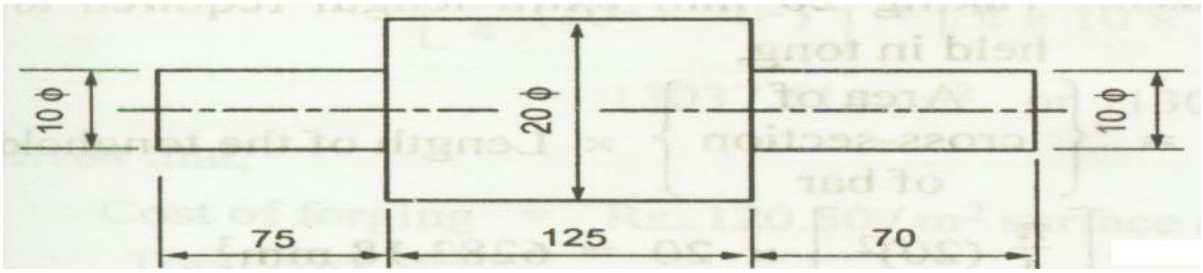


3. 750 stepped spindles are to be made by machine forging. Estimate the net weight, gross weight and number of bars required if mild steel are available in 4 mm length and 25 mm diameter. Take the density of M.S bar 7.6 gm/cc. consider all the possible forging losses.

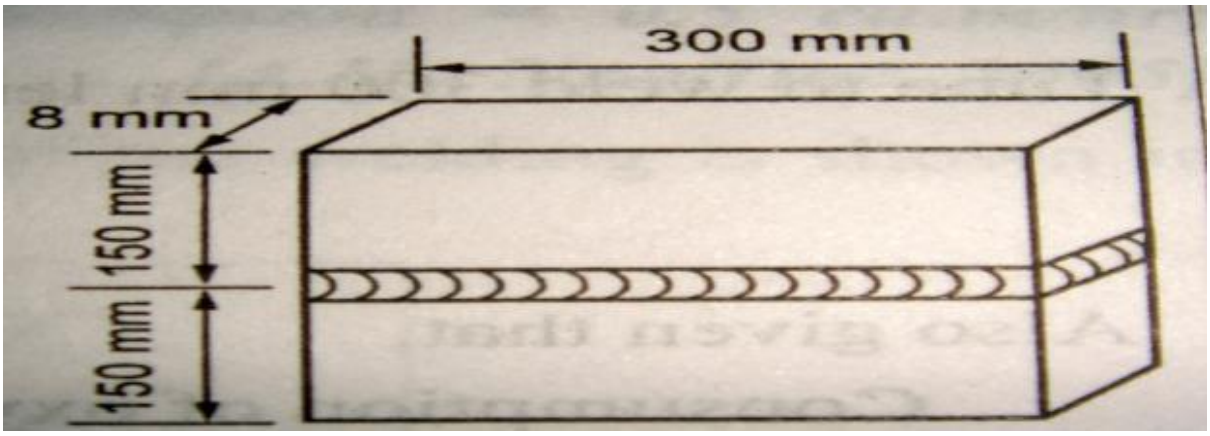


4. A square bar of 3 cm side and 25 cm length is to be hand forged into a hexagonal bar of side of 1.5 cm. Find length of the hexagonal bar ignoring metal losses.Density remains same. ?(Nov/Dec 2015)

5. 150 pieces of shafts as shown in figure are to be forged from the raw stock of tcm dia .Estimate the cost incurred assuming that material cost =Rs5.20 per metre. Cost of forging = Rs120.50 per sq.m of surface area to be forged. Overhead expenses to be 100% of the cost of forging .Consider all losses.



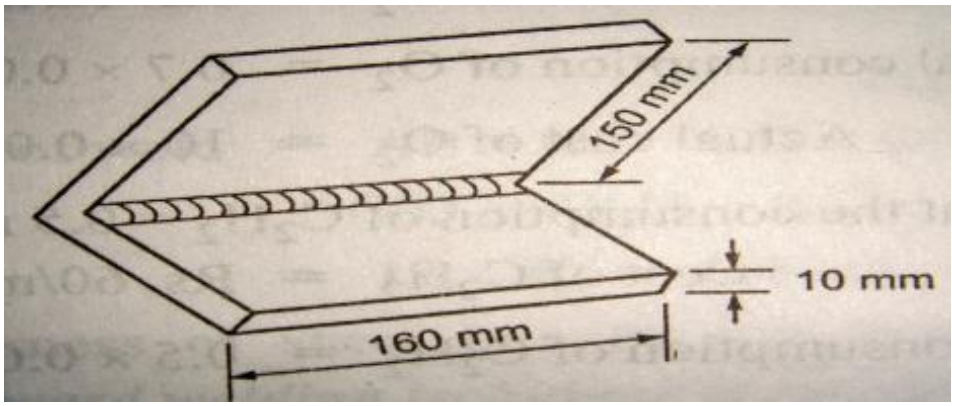
6. 6. What is the material cost of welding two plates of size 300mm length and 150mm width and 8mm thickness to make a piece 300 x300 mm approximately. Use rightward technique with no edge preparation cost .Take overall cost of oxygen as Rs.0.70 per cu m,cost of acetylene at Rs 7 per cum ,Cost of filler metal Rs 2.50 per kg and 1Cu.Cm of filler metal weighs 11.28 gms .Assume dia of filler rod = 4mm . Filler rod used per metre of weld = 3.4 m .Rate of welding = 2.1 m/hr.Consumption of oxygen = Consumption of acetylene = 7.1 Cu.m/hr



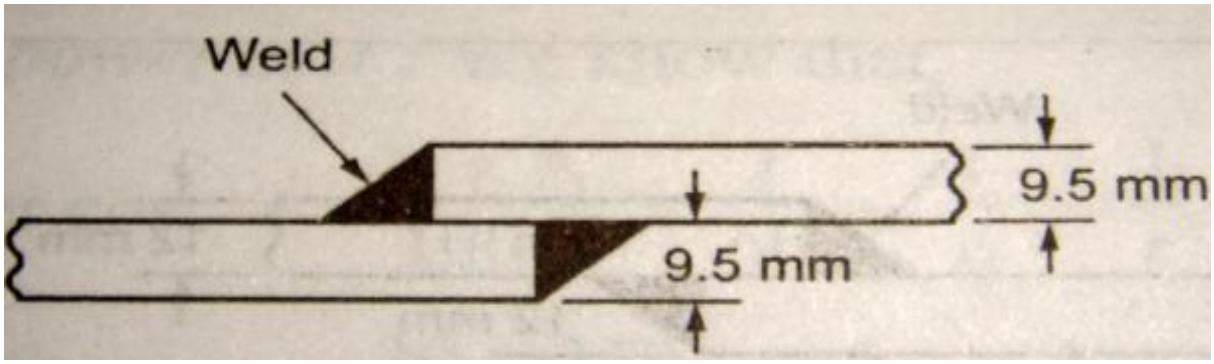
7. A foundry unit produces tractor components as cast. Calculate the selling price of producing a component weighing 50 kgs from the following data(i)Material of the component is cast iron with density = 7.2gm/cc(ii)Cost of molten iron at cupola=Rs2.5 per kg(iii)Process scrap = 17% of net weight(iv) Scrap return value = Rs 1.1per kg (v) Administrative and sales overheads = Rs 5 per piece(vi)Profit 10%of total cost(vii) other expenditure is given in table below

Operation	Time per component (min)	Labour cost per component(Rs)	Shop overheads per hour(Rs)
Moulding and pattern making	6	2.6	4.25
Core making	8	2.4	3.5
Fettling and cleaning	10	2.75	3

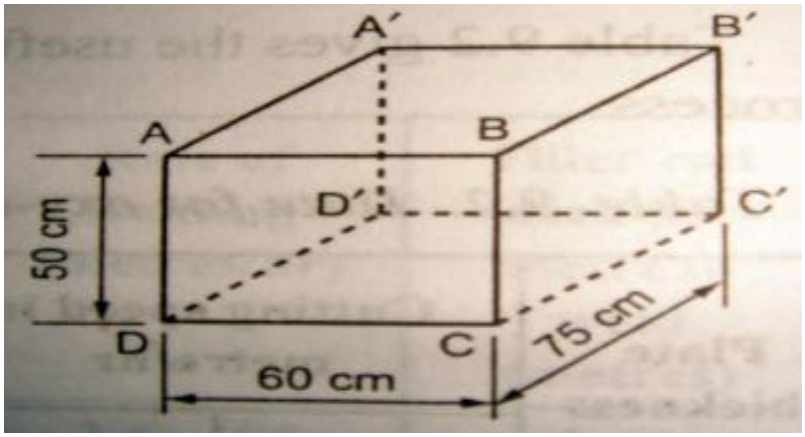
8. Estimate the material cost for welding 2 flat pieces of M.S 15x16x1 cm size at an angle of 90 by gas welding .Neglect edge preparation cost and assume Cost of O2 = Rs 10/cu.m,cost of C2H2= Rs60/cu.m,density of filler metal = 7 gm/cc; Cost of filler metal = Rs12/kg;Filler rod dia = 5 mm , filler rod required 4.5 mm / m of weld, welding time = 30 min /m of welding, consumption of O2 = 0.7cu.m/hr and consumption of C2H2 = 0.5 cu.m/hr.



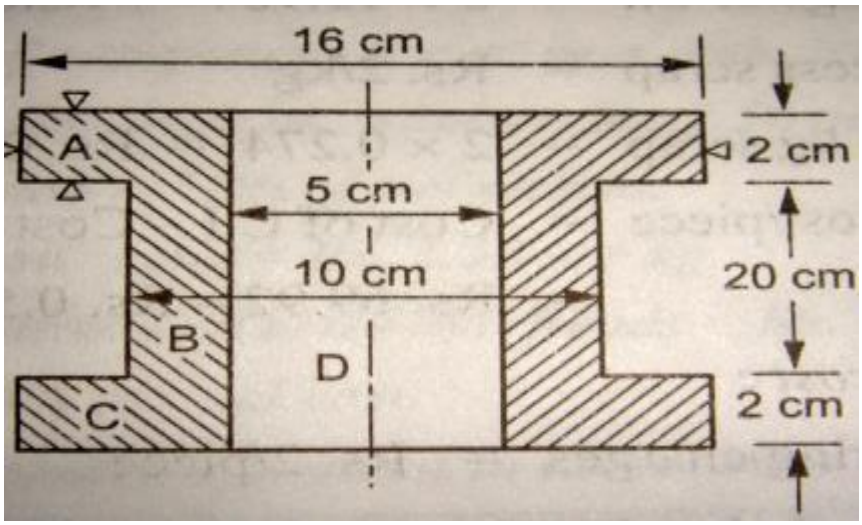
9. A lap joint is to be prepared in 9.5 mm M.S. sheet using flat welding position and 6 mm electrode .Current used is 250 A and voltage is 30 V.Welding speed is 12 m/Hr and 0.3 Kg of metal is deposited per metre length of joint.Labour cost Rs 1.5 per hour ,power Rs 0.20 per KWhr and electrode Rs 4 per Kg Effeciency of machine is 50% and operating factor is 60 % Calculate the cost of labour , power and electrode per metre of weld.



10. An open water tank of size 75cm x 60cm x 50cm is made by gas welding from a 4 mm thick metallic sheet .Estimate the time require for welding a tank .Neglect other factors. Rate of welding = 5m/hr



11. Estimate the total cost of 20 CI flanged pipe casting shown in figure, assuming the following data, Cost of CI=Rs.5/kg,cost of process scrap Rs.2/kg,process scrap 2% of net weight of casting , moulding and pouring charges = Rs.2/piece ,casting removal and cleaning = Rs0.5/piece ,administrative overheads = 5% factory cost ,selling overheads = 70%administrarive overheads



12. A small fuse box 300mm long , 20 mm wide and 60 mm deep with a 30 mm deep is to be manufactured in grey iron .The average thickness is 4.5 mm .The pattern supplied by the customer is of loose type, hence bench moulding is to be followed . Estimate the selling price per piece, assume the following data: (i)Cost of iron at the cupola sprout = Rs1.2 per kg (ii)Cost of process scrap return = Rs 55 paise per kg (iii)Administrative on cost = Rs 3.2 per hour (iv) Profit margin = 16% (v) Density = 7.3 gm/cc , (vi) Process scrap = 20% of net weight . Other expenditure details are

Operation	Time per piece	Labour charges per minute	Works on cost per hour
Moulding and pouring	16 min	Rs. 1.50	Rs.4.50
Shot blasting	6 min	Rs. 0.25	Rs. 4.00
Fettling	4 min	Rs. 0.10	Rs. 3.25

To find selling price per piece.

13. A small fuse box 25 cm long, 17.5cm wide and 5 cm deep with a lid 2.5cm deep is to be manufactured in grey iron .It has the usual legs and ears with an average thickness of 3.9 mm. The pattern supplied by the customer is of loose type, hence bench moulding is to followed. Estimate the selling price per piece, given the following data(i)Cost of iron at the cupola spout = 660 paise / kg (ii)Cost of process scrap return = 30 paise /kg (iii) Administrative on cost = Rs 2.00/hr (iv) Profit margin = 15 % Assume: Gate is 18.5mm in diameter and 5cm long. Runner is 1.85cm wide,22.5cm long and 1.25 cm deep. 4 gates and 4 runners.(i.e two on the box and lid each)

Operation	Time per piece	Labour charges per minute	Works on cost per hour
Moulding and pouring	20 min	Rs. 2.00	Rs. 3

Shot blasting	2 min	Rs. 0.20	Rs. 5
Fettling	1 min	Rs. 0.05	Rs. 3

UNIT V MACHINING TIME CALCULATION

Estimation of Machining Time - Importance of Machine Time Calculation- Calculation of Machining Time for Different Lathe Operations ,Drilling and Boring - Machining Time Calculation for Milling, Shaping and Planning - Machining Time Calculation for Grinding

PART –A

1. What is meant by machining time?

Generally, machining time is the term used when there is a reduction in material or removing some undesirable parts of a material. For example, in a drill press,machining time is when the cutting edge is actually moving forward and making a hole.

2. What is mean by length of cut?

Length of cut is the distance travelled by the tool to machine the work piece.

3. Difference between feed and depth of Cut.

Feed is the distance, through which the tool advances into the workpiece during one revolution of the workpiece or cutter. .

Depth of cut is the thickness of the layer of metal removed one cut or pass, measured in à direction perpendicular to the machined surface.

The dèpth of cut is always perpeñdicular to the direction of feed motion.

4. What do you mean by 'tool approach' and 'tool over travel?

Show diagrammatically how these terms are related to the length of cut for a cutting operation. Approach length is the distance a tool travels, from the time it touches the work piece until it is cutting to full depth.

Over travel is the distance over which the tool idles before enters and after it leaves the cut.

5. List the factors to be considered for the Selection of feed and Depth of cut for a particular operation.

The feed an Depth of cut for a particular operation depend on the Material to be machined, surface finish required and tool used.

6. Define the term cutting speed.

Cutting speed defined as the relative speed between tool and the job.

7. What are the various factors considered for selection of cutting speed

Cutting speed depends on the cutting tool material the work material and the operation.

8. What is meant by turning operation?

Turning is the process of removing the excess material from work piece by means of single point cutting tool.

9. What is grinding? Differentiate between surface grinding and cylindrical grinding. Grinding is the process of metal removal by abrasion. In surface grindìng the workpiece reciprocates under the rotating grinding wheel .In cylindrical grinding the revolving wheel moves along the axis of the work and removes the metal to the required depth of cut.

10. What are the Purpose of chamfering and chamfering operations?

Chamfering is the operation of removing material from the edges of external or internal diameters. Chamfering is done to facilitate the entering of mating parts to form to set or remove sharp edges.Knurling is the operation of upsetting material so as to produce diamond shaped orstraight1ined patterns on the surface of the material. knurling is done to provide gripping when the job is grasped by hand.

11. Difference between drilling ,boring and reaming.

Drilling:-operation of making a circular hole by removing a volume of metal from the job by a rotating cutting tool called drill.

Boring:-Process of enlarging a hole.

Reaming:-Operation of finishing a drilled hole.

12. what is milling?

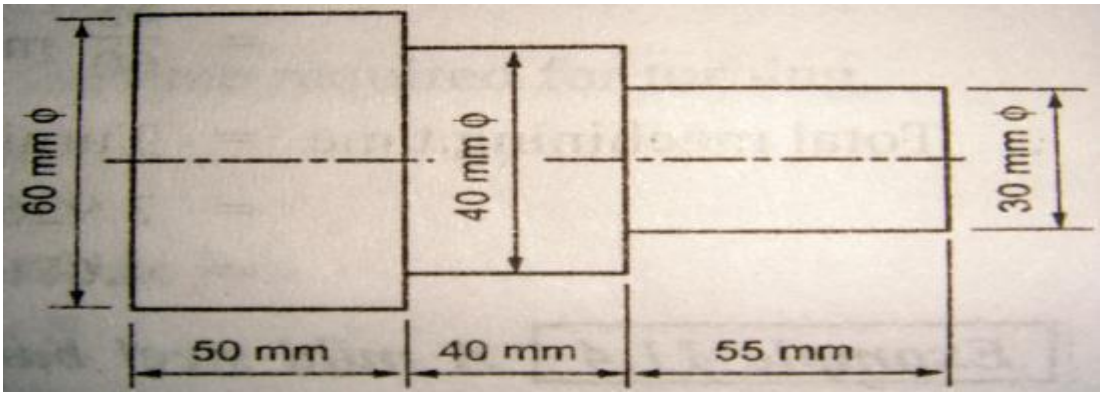
Milling is the machining process of using rotary cutters to remove material from a workpiece by advancing (or feeding) in a direction at an angle with the axis of the tool It covers a wide variety of different operations and machines, on scales from small individual parts to large, heavy-duty gang milling operations. It is one of the most commonly used processes in industry and machine shops today for machining parts to precise sizes and shapes.

PART –B

1. Describe the procedure of estimating the machining time required during the shaping operation on a shaper.**(April/May 2015)**

2. 10.(i)A 25 cm x 10 cm C.I surface to be faced on a milling machine with a cutter of diameter of 15 cm and 16 teeth.If the cutting speed and feed are 55 m/min and 6 cm/min respectively, determine the rpm of the cutter,feed/tooth and the milling time. (ii) find the time required for finish grinding a 20 cm long steel shaft to reduce its diameter from 4.5 cm to 4.3 cm with a grinding wheel of 2.5 cm face width. Cutting spedd is 16 m/min and depth of cut is 0.2 mm. (iii)Calculate the cutting speed on a job of 50mm diameter rotating at 200 rpm**.(Nov/Dec 2015)**

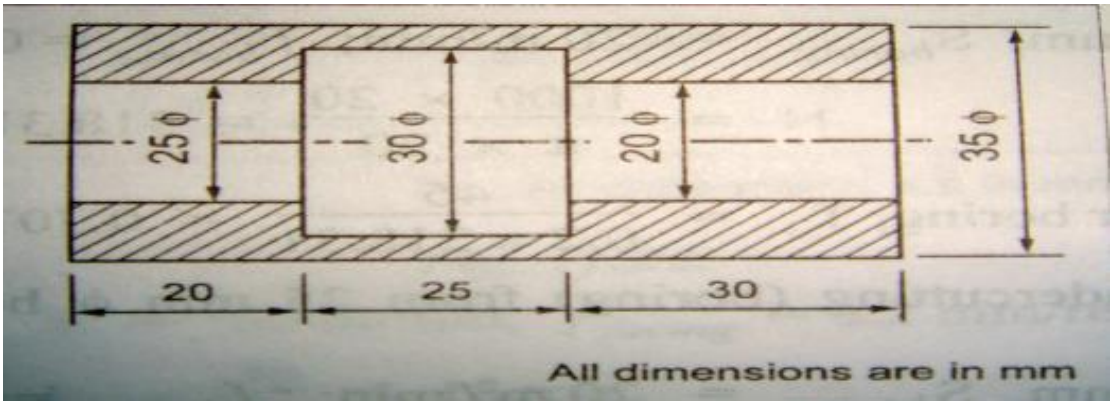
3. What is the machining time to turn the dimensions given in figure.The material is brass , the cutting speed with H.S.S tool being 60 m/min and the feed is 7.5mm/rev, depth of cut is 3 mm per pass.



4. A 150 mm thick laminated plate consists of 90 mm thick steel plate and 60 mm thick brass plate .A 20 mm dia hole is to be drilled through this plate .Estimate the total time taken for drilling if , cutting speed for steel = 25 m/min , cutting speed for brass = 50 m/min ,feed of 20 mm drill for steel = 0.2 mm/rev , feed of 20 mm drill for brass = 0.25 mm/rev.

5. Calculate the drilling and tapping time for producing threads in a mild steel of 25 mm thickness. The size of H.S.S drill to be used is 20 mm and the number of threads to be cut is 3 per cm. Taking cutting speed and feed for drill as 20 m/min and 0.25 mm/rev respectively, tapping speed as 5m/min. Neglect the time taken for setting up and approaching and over travelling of tools

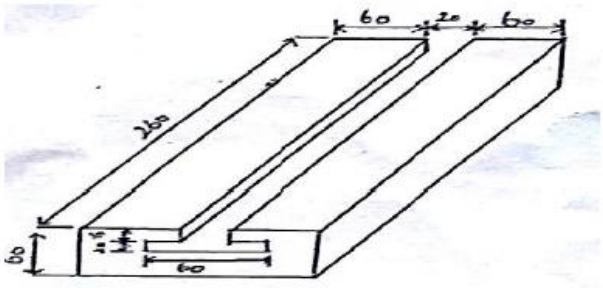
6. Estimate the time taken to prepare a job from M.S.stock bar 4 cm in dia and 7.5 cm long.Assume the following data , Cutting speed for turning and boring = 20 m/min . Cutting speed for drilling operation = 30m/min.Feed for turning and boring operation = 0.2 mm/rev .Feed for 20 mm drill = 0.23 mm/rev .Depth of cut not to exceed 3 mm in any operation



7. Find the time required on a shaper to machine a plate 1100*500mm , if the cutting speed is 16 m/min.The ratio of return stroke time to cutting stroke time is 2 : 3 .The clearance at each end is 20 mm along the length and 15 mm on width .Two cuts are required , one roughing cut with cross feed of 2 mm per stroke and one finishing cut with feed of 1.25 mm per stroke

8. Find the time required for doing rough grinding of a 15cm long steel shaft to reduce its dia from 4 to 3.8 cm with the grinding wheel of 2cm face width .Assume cutting speed as 15 m/min and the depth of cut as 0.25 min.

9. A T-Slot is to be cut in a C.I slab in fig. given below. Estimate the machining time. Take cutting speed 25 m/min, feed is 0.25 mm/rev. Dia of cutter for channel milling is 80 mm. Nov/Dec 2014



10. Calculate the machining time required to produce one piece of the component shown in fig. Starting from f 25mm bar. The following data is available. For turning: Cutting Speed = 40 m/ min; Feed = 0.4 mm/rev; Depth of cut = 2.5 mm/per pass; For thread cutting: Cutting speed = 8 m/ min; (**Nov/Dec 2014)**

11. i)In a manual operation, observed time for a cycle of operation is 0.5 minute and the rating factor as observed by the time study engineer is 125%. All allowances put together is 15% of normal time. Estimate the standard time.
ii. In a manufacturing process the observed time for one cycle of operation is 0.75 minute. The rating factor is 110%. The following are the various allowances as the percentage of normal time. Personal allowance = 3% ; Relaxation allowance= 10%; Delay allowance= 2%; Estimate the standard time.

12. It is required to produce a hole 15 mm in dia and 10 cm deep through the mild steel piece. Estimate the time taken for completing the hole in the following two cases(i)The hole is drilled by a 15 mm drill .Assume the cutting speed for the mild steel to be 30 m/min and the feed for 15 mm drill to e 0.2 mm/rev.(ii)First, a 10 mm hole is drilled which is then brought to accurate size by boring . Assume the cutting speed for boring and drilling to be 30m/min. The feed for 10mm drill to be 0.15 mm/rev and the feed for the boring operation to be 0.13mm/rev.