# QUESTION BANK

**Name of the Department : Mechanical Engineering**

**Subject Code & Name : ME8793 / Process Planning and Cost Estimation**

**Year & Semester : IV & VII**

## UNIT-I

## INTRODUCTION TO PROCESS PLANNING

### PART - A

1. What is process planning?

It may be defined as the determination of the processes and the sequence of operations required to make the product. It consists of devising, selecting and specifying processes, machine tools and other equipment to transform the raw material into finished product as per the specifications called for by the drawings.

2. Write the purpose of process planning

The purpose of process planning is to determine and describe the best process for each job so that: (i) Specific requirements are established for which machines, tools and other equipment can be designed or purchased. (ii) The efforts of all engaged in manufacturing are co-ordinated. (iii) A plan is made to show the best way to use the existing or proposed facilities.

3. What are the all the responsibilities of process planning engineer? (Dec 2013)

When the design engineers have designed the product, the assembly drawings and working drawings of individual components are made. The process planners have to see how the product can best be made to meet the specifications mentioned in the part drawing

4. What are the factors affect process planning?

The three classic factors that affect the planning process in business are inputs, processes and outcomes. Inputs are raw materials, resources, knowledge and anything else brought to the planning process. Processes are what you do to the inputs to create outcomes. Outcomes are partly profits, but also jobs created for employees, and the use and pleasure that consumers receive from finished products or services.

5. What are the steps involved in Process planning?

Steps involved in Process Planning

- Preliminary analysis and Product design evaluation
- Selection of manufacturing process
- Selection of Machine Tool
- Selection of Tooling and Process parameters
- Final operation sequence selection

6. What are the factors should be considered in selection of tooling?

- The type and amount of the material to be cut
- The surface finish required
- The rigidity and shape of the part .
- The capacity and condition of the available equipment
- The succeeding operations such as finish grinding and honing
- The recommendations given in tables should be considered only as a starting point. A detailed analysis is further required in each individual case to arrive at the most feasible solution.

7. What arc the prerequisites for process planning?

The other prerequisites for process planning are:

*(i)* Part list
*(ii)* Annual demand/ batch size
*(iii)* Accuracy and surface finish requirement
*(iv)* Equipment details
*(v)* Data on cutting fluids, tools, jigs and fixtures, gauges.
*(vi)* Standard available stock sizes.
*(vii)* Machining data, data on handling and setup.

8. What are the factors affecting process design

There are three basic factors that affect the design of a manufacturing process, namely:

*(i)* The volume or quantity of the product to be manufactured.
*(ii)* The required quality of the product.
*(iii)* The equipment that is available, or that can be procured, for the manufacture of the product.

9. What are the various approaches of process planning?

There are fundamentally two different approaches when computers are used in the process planning task.

(1) Variant or Retrieval method of process planning.
(2) Generative method of process planning.

10. What is CAPP?

Computer-aided process planning (CAPP) is the use of computer technology to aid in the process planning of a part or product, in manufacturing. CAPP is the link between CAD and CAM in that it provides for the planning of the process to be used in producing a designed part

11. What are the advantages of CAPP?

*(i)* Investment in hardware and software is not much.
*(ii)* The system offers a shorter development time and lower manpower
*(iii)* Consumption to develop process plan.
*(iv)* The system is very reliable and reasonable in real production
*(v)* Environments for small and medium size companies.

12. Why we need to automated the process planning
    *(i)* Shortening the lead-time
    *(ii)* Manufacturability feedback
    *(iii)* Lowering the production cost
    *(iv)* Consistent process plans

## Part-B

1. What are the steps required to carry out the manual process planning activity?
2. List the objectives, purpose, and scope of work study. (16) (Nov2009)
3. Explain (i)Briefly explain process planning? (8) Objectives. (May 2014).
13. (ii)What are the activities associated with it? (8)
4. Explain the technological framework of process by using a block diagram. (16)
5. List the information required for process planning. (16)
6. What are the factors that influence process planning? (16) (Nov2011), (Dec 2013)
7. Explain in detail the process planning activities. (16) (NoV2009), (Dec 2013)
8. (i) Explain the manual approach to process planning. (8)ii) What are advantages and limitations? (8)
9. (i) What is meant by CAPP? (4) (ii) List out the benefits of CAPP systems. (12) (Nov2011)
10. Explain the two approaches commonly used in CAPP system bringing out their advantages and
14. Limitations. (16)
11. Compare and contrast the features of a variant and generative CAPP system. (16) (Nov2011)
12. Write short notes on 'tools for developing manufacturing logic and knowledge. (16)
13. What are the advantages and limitations of using?

*(i)* Flow charts (8) (ii) Decision tables (8)

14. What factor should be considered while selecting the best process planning system? (16)
15. i)Discuss in Detail the retrival type computer aided process planning system (10) (Nov 2009)

ii) Compare the manual and CAAP systems (6) (Nov 2009).

16. Explain fixing the operating sequence and hence the selection of machines. (May2014).
17. Write a note on the steps involved development of of manufacturing logic and knowledge.

## UNIT-II
## PROCESS PLANNING ACTIVITIES
## PART - A

1. What are all the process parameters considered for selecting production processes?
   The manufacturing process selected must be an economical balance of materials, manpower, product design, tooling and equipment, plant space, and many other factors influencing cost

and practicality. The process must be selected in such a way that the produced product will be acceptable to the consumer functionally, economically and appearance-wise

2. How to use the materials more economically in production process
   - Better stock utilization through materials control
   - Sale of scrap
   - Re-usable materials
   - Material cost balance sheet
   - Process effects materials cost
3. How to reduce the processing cost?

The cost of processing can be reduced by eliminating unnecessary operations. This can be achieved in number of ways and are accomplished through proper planning

- Changing product design.
- Changing the operation sequence.
- Changing the basic process.
- Combining operations.

4. What are the advantages of combining operations?
   - Improved accuracy
   - Reduced labor cost
   - Reduced plant fixed cost
   - Less tooling required
   - Less handling required
   - Fewer setups
   - Smaller in process inventory
   - Less scrap
   - Fewer inspection points required
5. What are the limitations of combined operations?
   - Maintaining tool accuracy
   - Possible higher tool costs
   - Maintaining dimensions for several baselines
   - Combination tooling subject to downtime
   - More costly setups
   - More costly scrap
   - Compromises on operational speed
   - Chip disposal
6. What are the considerations for selecting tooling
   - In selecting dies, jigs or fixtures for a given process, there are three essential considerations that demand the attention of process engineer
   - Quality of the product

- Total volume to be produced 5
- Required rate of production

7. What are the factors considered for make or buy decision?
   1. Volume required
   2. Cost
   3. Life of the product
   4. Degree of product standardization
   5. Degree of manufacturing specialization
   6. Alternative source of supply
   7. Reliability of supplier

8. What are diminishing returns?
   When the value of common variable (cutting speed) is increased, there will be a corresponding increase in the return (may be volume or profit) up to a point where return is no longer a proportional. This point is called the point of diminishing returns

**Part-B**

1. Write the Fundamental Rules for the selection and Planning of a Manufacturing Process (16marks)
2. Explain the advantages of combining operations in manufacturing process (12marks)
3. Write the Effect of operational speed on performance and economy? (10marks)
4. Describe the Effect of cutting speed on volume, unit cost and total profit with the help of graph.(16marks)
5. Give some case study for changing basic process reduced to the number of operations required?
6. Explain how the casting process can affect the material cost ? (12marks)
7. Give some engineering product case study for combining operations? (16 marks)
8. Write the set of documents required for process planning.

## UNIT-III
## INTRODUCTION TO COST ESTIMATION

**PART - A**

1. Define Cost Estimation .
   An approximation of the probable cost of a product, program, or project, computed on the basis of available information. Four common types of cost estimates are: (1) Planning estimate: a rough approximation of cost within a reasonable range of values, prepared for information purposes only. Also called ball park estimate. (2) Budget estimate: an approximation based on well-defined (but preliminary) cost data and established ground rules. (3) Firm estimate: a figure based on cost data sound enough for entering into a binding

contract. (4) Not-to-exceed /Not-less-than estimate: the maximum or minimum amount required to accomplish a given task, based on a firm cost estimate 6

2. What are the types of Estimation?
   - *(i)* Order of Magnitude Estimate
   - *(ii)* Square Foot and Cubic Foot Estimates
   - *(iii)* Assemblies (or Systems) Estimate
   - *(iv)* Unit Price Estimate

3. What are the methods of Estimation?
   Estimation methods broadly follow evaluation designs, with the determination of the counterfactual being the core of the evaluation design. Different ways to establish controls under different evaluation designs determine the methods to be used to measure the counterfactual
4. State the importance of realistic estimates.
   Effective project managers cultivate the courage and competency to push back against arbitrary budgets and deadlines to negotiate realistic win-win cost and schedule estimates for their projects. This article explores how to negotiate realistic estimates to set realistic expectations.
5. What is design cost?
   Design-to-cost is a strategic management commitment to invest in the present for a significantly greater reward in the future. Design-to-cost is one of the strongest levers in the cost improvement toolbox.Design-to-cost simply means designing a product from scratch to meet the "target cost" or the market price which customers are willing to pay, for a particular (or specified) level of functionality and quality, while returning a profit to the enterprise.
6. What is labour cost?
   The cost of wages paid to workers during an accounting period on daily, weekly, monthly, or job basis, plus payroll and related taxes and benefits
7. What do you mean by overhead cost?
   The ongoing administrative expenses of a business which cannot be attributed to any specific business activity, but are still necessary for the business to function. Examples include rent, utilities, and insurance.
8. Define costing or cost accounting? (Dec2015)
   It is the determination of an actual cost of a component after adding different expenses incurred in various departments. It is the systematic procedure for recording accurately every item of expenditure incurred on manufacturing of a product by different sections
9. What are the methods of costing? (Dec 2013) 7
   1. Job costing
   2. Batch costing
   3. Process costing

4. Departmental costing
5. Operating cost method
6. Unit cost method
7. Multiple cost method

10. How are standard data developed? (Dec 2013)
    i) special charts, ii) tables, iii) time studies, iv) technical books

**PART - B**

1. (i)What is cost estimation? (8) (ii)State the objectives of cost estimation. (8) (Nov2009), (Nov 2014), (dec2015)
2. List the functions of estimating. (16)
3. Explain the type of cost estimates that are used in estimating. (16), (dec2015)
4. List and discuss the different methods of cost estimating. (16) (Nov 2009), (Dec 2013)
5. List the various data required to make a cost estimation and their sources (16),(Dec2015)
6. List the various types and sources of data required by the cost estimator. (16) (Nov 2011)
7. Describe the various constituents of estimation. (16)
8. What shall be the effects of the following on an enterprise?
   (i) Under estimating, (8) 8
   (ii) Over estimating. (8)
9. (i)What do you mean by a realistic estimate? (8)
   (ii) Describe its importance in production. (8)
10. Explain the procedure followed for estimating the cost of an industrial product. (16)
11. Explain in detail the procedure for estimating the cost of water supply fitting in residential building. (16).
12. (i)Define costing or cost accounting (6) Explain the advantages of cost accounting(6), (dec2015)
    (ii) Why costing is essential to industrial control? (10)
13. (i) What is the purpose of costing? (8)
    (ii) Differentiate between estimating and costing. (8)
14. Explain the various methods of costing. (16) (Nov 2009)
15. What is meant by analytical estimating? Write its procedure, advantages , limitations and Applications ? (Dec 2013)
16. Write critical notes on objectives and methods of cost estimation. (MAY 2014).
17. Explain suitable example classification of cost. (MAY 2014).

**UNIT-IV**
**PRODUCTION COST ESTIMATION**
**Part-A**

1. Define forging.

   A process of working metal to a finished shape by hammering or pressing and is primarily a "hot" operation. It is applied to the production of shapes either impossible or too costly to make by other methods or needing properties not obtainable by casting. Categories of forgings include Hammer, Press, Drop or Stamping.

2. Differentiate hot forging and cold forging.

Hot forging is defined as working a metal above its recrystallization temperature. The main advantage of hot forging is that as the metal is deformed the strain-hardening effects are negated by the recrystallization process.

Cold forging is defined as working a metal below its recrystallization temperature, but usually around room temperature. If the temperature is above 0.3 times the melting temperature (on an absolute scale) then it qualifies as warm forging.

3. What are the types of welding?

1. Tig welding
2. Shielded metal arc welding also known as just plain arc welding or stick welding
3 Mig welding

4. What is shrinkage allowance?

A shrinkage allowance for metal casting is something that must be figured into a design from the very beginning. As the molten metal cools and solidifies it will begin to contract. This means that although the molten metal completely filled up a mold, by the time the casting was cold, the casting is smaller than the mold.

5. What is the pattern?

A pattern, from the French patron, is a type of theme of recurring events or objects, sometimes referred to as elements of a set of objects. The elements of a pattern repeat in a predictable manner. Patterns can be based on a template or model which generates pattern elements,especially if the elements have enough in common for the underlying pattern to be inferred, in which case the things are said to *exhibit* the unique pattern.

6. In what ways, press forging and upset forging are different?

Press forging works by slowly applying a continuous pressure or force, which differs from the near-instantaneous impact of drop-hammer forging. The amount of time the dies are in contact with the workpiece is measured in seconds (as compared to the milliseconds of drop-hammer forges). The press forging operation can be done either cold or hot.

Upset forging increases the diameter of the workpiece by compressing its length. Based on number of pieces produced this is the most widely used forging process. A few examples of common parts produced using the upset forging process are engine valves, couplings, bolts, screws, and other fasteners.

7. what are the losses in forging

* shear loss
* scale loss
* flash loss
* sprue loss

8. What is flash loss?

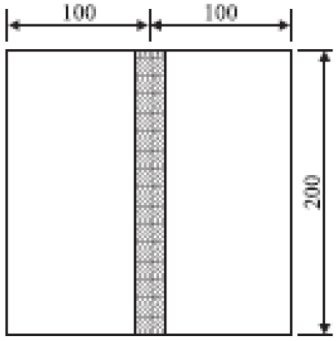
The quatity of material comes out of the die at the parting line of the top and bottom halves of the die. This wastage material is flash loss.

9.What is sprue loss?

The portion of material between the tong hold length and the material in the die is called sprue or runner. The material loss in this portion is called sprue loss.

## Part-B

1. Describe the step by step procedure to estimate the forging cost(16marks)
2. Explain the steps involved to estimate the foundry cost with suitable examples (12 marks )
3. Explain the steps involved to estimate the welding cost with suitable case study(16marks)
4. 200 pieces of bolt are to be made by upsetting from 25mm diameter. What is the length of each bolt before upsetting?. What length of the rod required if 3.5% of the length goes as scrap
5. 12.A square bar of 3 cm side and 25cm length is to be hand forged into a hexagonal bar of side of 1.5cm. Find the length of the hexagonal bar ignoring metal losses. Density remains same.(Dec2015)
6. A production shop had its production overheads of Rs.12,000/- and the production for the period in terms of direct labour was 24,000 hours. Find the over head for a job requiring 20 labour hours (Dec 2015)
7. Calculate the cost of welding two plates 200 mm × 100 mm × 8 mm thick to obtain a piece 200 mm × 200 mm × 8 mm approximately using rightward welding technique Fig. 4. The following data is available :
   Cost of filler material = Rs. 60 per kg
   Cost of oxygen = Rs. 700 per 100 cu meters
   Cost of acetylene = Rs. 700 per 100 cu meters
   Consumption of oxygen = 0.70 cu m/hr
   Consumption of acetylene = 0.70 cu m/hr
   Diameter of filler rod = 4 mm
   Density of filler material = 7.2 gms/cc
   Filler rod used per meter of weld = 340 cms
   Speed of welding = 2.4 meter/hr
   Labour is paid Rs. 20 per hour and overheads may be taken as 100 percent of labour cost.




8. Calculate the welding cost from the following data :
   Plate thickness = 12 mm
   Form of joint = 60°V
   Root gap = 2 mm

Length of joint = 2 meters
Electrode diameters = 3.5 mm and 4.0 mm
Electrode length = 350 mm
Electrodes required per meter weld = 10 nos. of 3.5 mm dia and for 100 per cent efficiency and 24 nos. of 4 mm dia 50 mm stub length
Average deposition h = 80 percent
Melting time per electrode = 1.3 minutes for 3.5 mm dia and 1.50 minutes for 4 mm dia electrode
Connecting ratio = 2
Hourly welding rate = Rs. 40
Overhead charges = 40 percent of welding cost.

9. Lap welded joint is to be made as shown in Fig.2. Estimate the cost of weld from the following data :

Thickness of plate = 10 mm
Electrode diameter = 6 mm
Minimum arc voltage = 30 Volts
Current used = 250 Amperes
Welding speed = 10 meters/hour
Electrode used per meter of weld = 0.350 kgs
Labour rate = Rs. 40 per hour
Power rate = Rs. 3 per kWh
Electrode rate = Rs. 8.00 per kg
Efficiency of welding m/c = 50 percent
Connecting ratio = 0.4 12
Overhead charges = 80 percent of direct charges
Labour accomplishment factor = 60 percent

## UNIT-V
## MACHINING TIME CALCULATION
### PART - A

1. What are the various elements of total time required to manufacture a component?
   - *(i)* Set-up time,
   - *(ii)* Handling time,
   - *(iii)* Machining time,
   - *(iv)* Tear down time,
   - *(v)* Down time, and
   - *(vi)* Allowances.
2. Define machining time?

It is the time for which the machine works on the component, i.e. from the time when the tool touches the work piece to when the tool leaves the component after completion of 14 operation. The machining time depends on the type and extent of machining required, material being machined, speed, feed, depth of cut and number of cuts required.

3. What is Tear Down Time
   It is the time taken to remove the tools, jigs and fixtures from the machine and to clean the machine and tools after the operation has been done on the last component of batch. The tear down time is usually small. The tear down time occurs only once for a complete lot or batch taken for machining. Standard data are available for tear down time for various machines.
4. What is Allowances
   In additions to the elements of time described above, the total time to perform an operation includes a number of allowances like time for personal needs of the operator, time for checking, time for tool sharpening etc.
5. Name the different types of allowances
   (a) Personal allowance
   (b) Fatigue
   (c) Tool sharpening/Tool change allowance
   (d) Inspection or Checking allowance
6. Define man hour and machine hour rate.
   As the name indicates, this method is simply a combination of man-hour rate and machine-hour rate methods. The man-hour rate method is suitable only where work is done by hand, for example, in fitting and assembly shops etc. Similarly, machine hour rate method is suitable where almost all the work is done by machines. Thus, in this way, both the methods can be applied in one factory. This method is combination of man-hour and machine-hour rate method of allocation.
7. What is unit rate?
   A rate is a ratio that is used to compare different kinds of quantities. A unit rate scribes how many units of the first type of quantity corresponds to one unit of the second type of quantity. Some common unit rates are miles (or kilometers) per hour, cost per item, earnings per week, etc. In each case the first quantity is related to 1 unit of the second quantity.

## Part-B

1. Find the time required for finish grinding a 20cm long steel shaft to reduce its diameter from 4.5cm to 4.3 cm with a grinding sheel of 2.5cm face width. Cutting speed is 16m/min.and depth of cut is 0.2mm. (Dec2015)
2. A 25 cm X 10cm C.I. surface is to be faced on a milling machine with a cutter of diameter of 15cm and 16 teeth. If the cutting speed and feed are 55m/min and 6cm/min. respectively, determine the rpm of the cutter feed/tooth and the milling time. (Dec2015)

3. Calculate the machining time to turn the dimensions shown in Fig.(1) Starting from a m.s. bar of f 80 mm. The cutting speed with HSS tool is 60 meters per minute and feed is 0.70 mm/rev., depth of cut is 2.5 mm per pass.

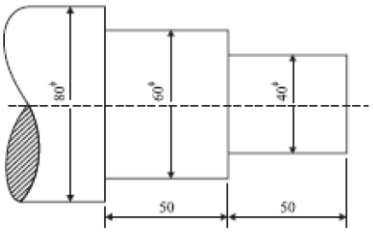
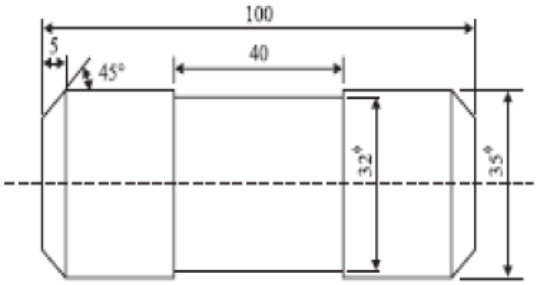


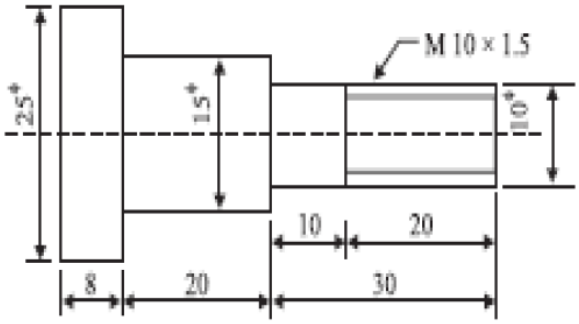

Fig.1

15.

4. A mild steel bar 100 mm long and 38 mm in diameter is turned to 35 mm dia. And was again turned to a diameter of 32 mm over a length of 40 mm as shown in the Fig.2. The bar was machined at both the ends to give a chamfer of 45° × 5 mm after facing. Calculate the machining time. Assume cutting speed of 60 m/min and feed 0.4 mm/rev. The depth of cut is not to exceed 3 mm in any operation.



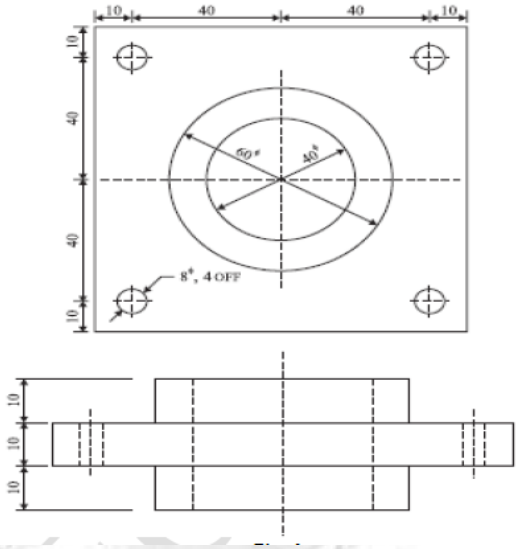

5. Calculate the machining time required to produce one piece of the component shown in Fig. starting from dia 25 mm bar. The following data is available.




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

6. Estimate the time taken to drill a 25 mm dia × 10 cm deep hole in a casting. First a 10 mm dia drill is used and then the hole is enlarged by a 25 mm dia drill. Assume :
   Cutting speed = 15 m/min.
   Feed for 10 mm drill = 0.22 mm/rev.
   Feed for 25 mm drill = 0.35 mm/rev.
7. Calculate the machining time to drill four 8 mm dia holes and one 40 mm dia central hole in the flange shown Fig. (4). 20 mm dia hole is drilled first and then enlarged to 40 mm f hole. Take cutting speed 10 m/min, feed for 8 mm drill 0.1 mm/rev, for 20 mm drill feed is 0.2 mm/rev. and for 40 mm drill feed is 0.4 mm/rev.




8.
9. Calculate the time required to tap a hole with 25 mm dia tap to a length of 30 mm having 3 threads per cm. The cutting speed is 10 m/min. For return stroke the speed is 2 times the cutting speed.