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Reg. No. :

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B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022.

Seventh/Eighth/Nineth Semester

Mechanical Engineering

ME 8793 – PROCESS PLANNING AND COST ESTIMATION

(Common to Manufacturing Engineering/ /Material Science and Engineering/Mechanical Engineering (sandwich)/Mechanical and Automation Engineering/Mechatronics Engineering/ /Production Engineering/Robotics and Automation)

(Regulations 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. List the variables to be considered while purchasing a machine to a manufacturing unit.
2. What is the current importance of Computer Added Process Planning (CAPP)?
3. What is the purpose of Process Planning?
4. What costs are associated with manufacturing?
5. Draw the cost ladder diagram with its constituent cost elements.
6. Draw the block diagram to show the build-up of total cost and selling price of a component.
7. What factors are considered while evaluating the cost of a welded joint?
8. What is shrinkage allowance?
9. What are the elements of machining time?
10. What are the standard data requirements for calculating cutting time in a shaping operation?

PART B — (5 × 13 = 65 marks)

11. (a) Using proper sub-headings, explain the steps in the process selection process with an example.

Or

(b) Draw a component of your choice and discuss the steps to be performed in production equipment and tool selection process.

12. (a) A component can be produced on either a capstan lathe or an automatic lathe. The different cost factors for the two machines are given below.

Machine I

Fixed cost = Rs.500

Variable cost = Rs.3 per piece

Machine II

Fixed cost = Rs.1,500

Variable cost = Rs.1 per piece

Assume that cycle time for production of the component is same for both the machines. Which machine will you select for producing

(i) 800, (7)

(ii) 700 components? (6)

Or

(b) Discuss the steps involved in process planning activities and as an engineer conclude your view on the need of Operation planning sheet.

13. (a) Explain the methods of costing followed in a manufacturing unit.

Or

(b) Detail the elements of cost under suitable headings and sub headings.

14. (a) A lap welded joint is to be made as shown in figure. 1

Figure. 1 Lap welded joint

Estimate the cost of weld from the following data:

(i)	Thickness of plate	=	10 mm
(ii)	Electrode diameter	=	6 mm
(iii)	Minimum arc voltage	=	30 Volts
(iv)	Current used	=	250 Amperes
(v)	Welding speed	=	10 meters/hour
(vi)	Electrode used per meter of weld	=	0.350 kgs
(vii)	Labour rate	=	Rs. 40 per hour
(viii)	Power rate	=	Rs. 3 per kWh
(ix)	Electrode rate	=	Rs. 8.00 per kg
(x)	Efficiency of welding m/c	=	50 percent
(xi)	Connecting ratio	=	0.4
(xii)	Overhead charges	=	80 percent of direct charges
(xiii)	Labour accomplishment factor	=	60 percent

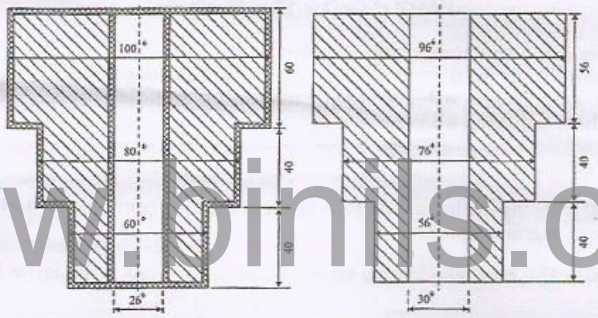
Or

(b) A cast iron component is to be manufactured as per figure 2. Estimate the selling price per piece from the following data:

Density of material	=	7.2 grams/cc
Cost of molten metal at cupola spout	=	Rs. 20 per kg
Process scrap	=	20% of net weight
Scrap return value	=	Rs. 6 per kg
Administrative overheads	=	Rs.30 per hour
Sales overheads	=	20 percent of factory cost
Profit	=	20 percent of factory cost

Other expenditures are:

Operation	Time (minutes)	Labour cost/hour in rupees	Shop overhead/ hour in rupees
Molding and pouring	15	20	60
Shot blasting	5	10	40
Fettling	6	10	40



(a) Component as cast (b) Finished component

Figure 2

All dimensions are in mm

15. (a) A T-slot is to be cut in a C.I slab as shown in figure 3. Take cutting speed 25 m/min feed is .25 mm/rev. Diameter of cutter for channel milling is 80 mm. Estimate the machining time.

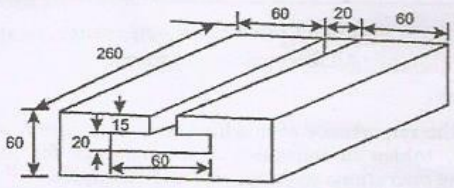


Figure 3

All dimensions are in mm

Or

(b) Calculate the machining time to turn the dimensions shown in figure 4 starting from a mild steel bar of 100 mm. The cutting speed with HSS tool 80 m/min and feed is 0.8 mm/rev., depth of cut is 3 mm per pass.

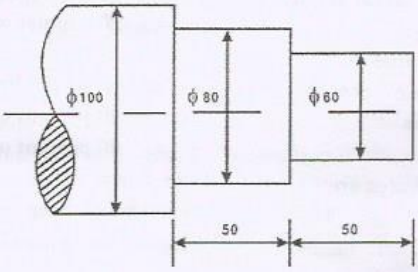


Figure 4

All dimensions are in mm

PART C — (1 × 15 = 15 marks)

16. (a) Consider the component as shown in figure 5. The component is to be made from mild steel with carbide tooling at a constant surface speed of 100 m/min. on a lathe with a maximum spindle speed of 1500 rev/min. The machining allowance is 2 mm.

Determine :

(i) if the lathe is capable of turning the component at the required surface speed. (8)

(ii) the total machining time for the component if the lathe is capable. (7)

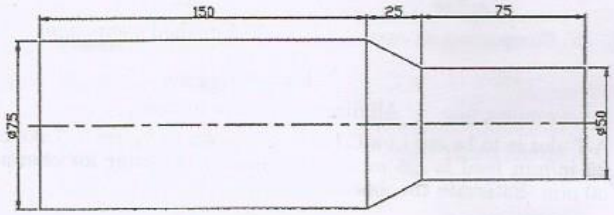


Figure 5 Cylindrical Component
All dimensions are in mm

Or

(b) Discuss the importance of machine time calculation by considering basic formulae, tables of variables and constants for at least 2 different machining operations with appropriate examples.

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