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Question Paper Code : 80927

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2024.

Seventh/Eighth/Ninth 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. What are the main activities undertaken during process planning?

2. Why is it important for the process planner to have a good knowledge of
    materials used in manufacturing?

3. Calculate the spindle speed required to turn a 75 mm diameter shoulder on a
    low-carbon steel component using a high-speed steel tool (Surface cutting
    speed=28 m/min). What is the percentage increase in cutting speed if a carbide
    tool (Surface cutting speed=180 m/min) is used instead?

4. What are the main reasons for using jigs and fixtures?

5. Differentiate between cost estimating and cost accounting.

6. List the main causes for depreciation.

7. Specify the commonly encountered losses in forging process.

8. What are the costs to be considered for estimating electric welding cost of a
    product?

9. Estimate the milling time to cut 60 teeth on a gear blank 60 mm thick, feed
    35 mm/min and take overall set up time as 10 min.

10. Estimate the time required for cutting 3 mm pitch threads on a mild steel bar
    of 28 mm diameter and 80 mm long. Take the cutting speed as 15 m/min.

PART B — (5 × 13 = 65 marks)

11. (a) What are the three main areas focused upon during material evaluation? Identify at least three typical considerations for each area and discuss the same.

Or

(b) What are the main operational and technical factors considered in equipment selection and which are the most relevant to the process planner? Explain with example.

12. (a) Identify and describe the main guidelines that should be applied when considering clamping forces.

Or

(b) A large manufacturer requires 1200 turned components every month for a regular order. Within their tooling machine shop area there are a wide variety of machines. It is decided to investigate if there is any significant advantage of producing the components on a CNC machine as opposed to a conventional machine. The following data is available:

Conventional milling machine:

Set-up time	=	55 min
Machining time	=	29 min
Material cost per unit	=	Rs. 9.52
Batch size	=	1200
Machinist's hourly rate	=	Rs. 7.85

CNC milling machine:

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Set-up time	=	2 h 15 min
Machining time	=	18 min
Material cost per unit	=	Rs. 9.52
Batch size	=	1200
Machinist's hourly rate	=	Rs. 10.85

Determine:

(i) the total component cost (T) for both machines; (6)

(ii) the break-even quantity and which machine should be used. (7)

13. (a) The catalogue price of a certain gadget is Rs. 1,050, the discount allowed to distributors being 20 percent. Data collected for a certain period shows that the selling price and factory cost are equal. The relation between material cost, labour cost and factory on cost (overhead expenses) are in the ratio 1 : 2 : 3. If the labour cost is Rs. 200, what profit is being made on the gadget?

Or

(b) What are the various methods of costing? Explain their adoptability in different industries.

14. (a) Calculate the gross weight of the mild steel bolt shown in Fig. 1, if it is produced in a lot of 5000, if steel weighs 7.9 g/cm³ and the method used is upsetting. Also calculate the length of the bar required. Consider all possible losses.
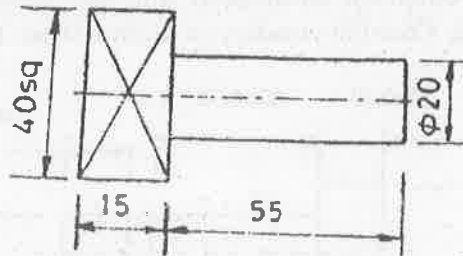
All dimensions are in mm

Fig. 1

Or

(b) A cylindrical boiler drum 4.5 m long × 2 m diameter is to be made from 22 mm thick plates. Both the ends are closed by welding circular plates to the drum. Cylindrical Portion is welded along the longitudinal seam. Welding is done both on inner and outer sides. Calculate the electric arc welding cost using the following data : (i) Rate of welding = 4 m/hr on inner side and 6.5 m/hr on outer side (ii) Length of electrode required = 2 m/m of welding (iii) Cost of electrode = Rs. 65/m (iv) Power consumption = 6 units/m of welding (v) Power charges = Rs. 12/unit (vi) Labour charges = Rs. 250/hr (vii) Overhead = 100% of prime cost (viii) Discarded electrodes = 7% (ix) Fatigue and setting-up time = 6% of welding time.

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15. (a) Estimate the grinding time to finish a shaft from 38.5 to 30 mm diameter. Length of the shaft is 300 mm. Assume the following data: Feed for roughing operation = 3.25 cm, Feed for finishing operation = 1.25 cm, Cutting speed = 12 m/min, Width if grinding wheel = 5, Depth of cut in roughing operation = 0.785 mm, Depth of cut in finishing operation = 0.05 mm. Assume 0.1 mm on diameter to be finished ground and remaining rough ground.
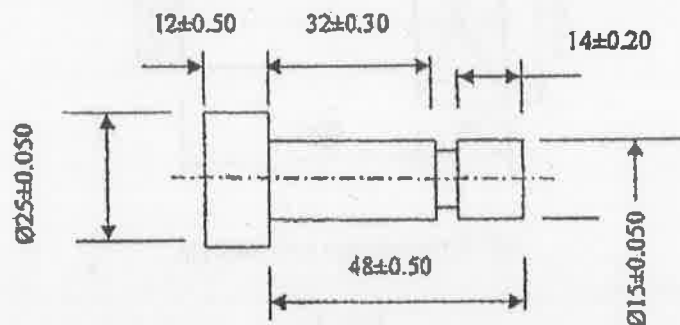
Or

(b) Estimate the time taken to drill a 25 mm diameter × 10 cm deep hole in a casting. First a 10 mm diameter drill is used and then the hole is enlarged by a 25 mm diameter 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.

PART C — (1 × 15 = 15 marks)

16. (a) Draw a component drawing of your choice and prepare a suitable process plan for the same.

Or

(b) Discuss the production equipment and tool selection for the component shown in Fig. 2. Consider undercut diameter as 12 mm.

All dimension are in mm

Fig. 2