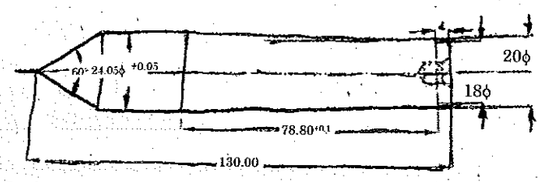
PART C — (1 × 15 = 15 marks)

16. (a) The component shown in figure is be manufactured at the rate of 500 components per month. Specify machine tools and cutting tools to used to machine the component from a bar stock of dimension 140 mm length and 26 mm diameter. Justify your answer.



Lathe dead centre
All dimensions in mm
T103 steel

Or

(b) A series of 5 mm hole (total number = 6) are to be drilled in a circle of 150 mm diameter on a 6 mm glass sheet. Describe the method of manufacture to be used with a neat sketch of the setup. What are the process variables to be controlled giving their effect on the final hole quality and the production rate.

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 80230

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Fourth Semester

Industrial Engineering

ME 8451 – MANUFACTURING TECHNOLOGY – II

(Common to: Industrial Engineering and Management/Mechanical Engineering/Mechanical Engineering (Sandwich)/Mechanical and Automation Engineering)

(Regulation 2017)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Name the seven elements of tool geometry for a single point cutting tool.
2. Name and briefly describe the four types of chips that occur in metal cutting operations.
3. What is the difference between a blind hole and a through hole? What is the significance of that difference?
4. Explain the relative characteristics of up milling and down milling process of material removal.
5. Explain why operations such as boring on a lathe and tapping are difficult.
6. Why four jaw independent chuck is preferred over three jaw chucks in turning operations
7. Explain the difference between generation and forming operations.
8. How do shaping and planning differ?
9. What is the difference between absolute and incremental programming?
10. What is the difference between a closed-loop control system and an open-loop control system?

PART B — (5 × 13 = 65 marks)

11. (a) (i) In an orthogonal cutting operation, the tool has a rake angle = 15°. The chip thickness before the cut = 0.30 mm and the cut yields a deformed chip thickness = 0.65 mm. Calculate (1) the shear plane angle and (2) the shear strain for the operation. (6)

(ii) Turning tests have resulted in 1-minute tool life at a cutting speed of 4.0 m/s and a 20-minute tool life at a speed of 2.0 m/s. (1) Find the n and C values in the Taylors tool life equation. (2) Project how long the tool would last at a speed of 1.0 m/s. (7)

Or

(b) (i) Identify the four forces that act upon the chip in the orthogonal metal cutting model and draw the merchant circle and identify these force. (8)

(ii) Name the three models of tool failure in machining and identify the two principal locations on a cutting tool where tool wear occurs? (5)

12. (a) (i) What is the profile of the threads in the lead screw a central lathe, justify your answer? (5)

(ii) A high-strength cast-iron bar 200 mm in diameter is being turned on a lathe at a depth of cut d = 1.25 mm. The specific power required to machine cast iron is 3.3W.s/mm³. The lathe is equipped with a 12kw electric motor and has a mechanical efficiency of 80%. The spindle speed is 500 rpm. Estimate the maximum feed that can be used before the lathe begins to stall. (8)

Or

(b) (i) A 150-mm-long, 12.5-mm-diameter 304 stainless steel rod is being reduced in diameter to 12.0 mm by turning on a lathe. The spindle rotates at N = 400 rpm, and the tool is travelling at an axial speed of 200 mm/min. Calculate the cutting speed, material-removal rate. cutting time, power dissipated, and cutting force. (8)

(ii) Explain the significance of operations facing and turning performed in the lathe with reference to the change in the geometry of the work piece. (5)

13. (a) (i) In a face-milling operation, the work piece dimensions are 100 mm by 250 mm. The cutter is 150 mm diameter, has eight teeth, and rotates at 300 rpm. The depth of cut is 3 mm and the feed is 0.125 *mm/tooth*. Assume that the specific energy requirement for this material is 5 Ws/mm^3 and that only 75% of the cutter diameter is engaged during cutting. Calculate (1) the power required and (2) the material- removal rate. (7)

(ii) Explain the working principles of gear shaving process. (6)

Or

(b) (i) A shaper is used to reduce the thickness of a $L \times B \times D$ mm^3. The starting dimensions of the part are $L \times B \times D_1$ mm^3. The cutting speed is $v.m/sec$ and the feed is f $mm/pass$. The shaper ram is hydraulically driven and has a return stroke time that is n% of the cutting stroke time. An extra L_1 mm must be added before and after the part for acceleration and deceleration to take place. Assuming the ram moves parallel to the long dimension of the part, how long will it take to machine, if the depth of cut is d mm? (7)

(ii) With simple line diagram explain various operations performed in a drilling machine. Also give salient features to explain reasons why a radial drilling machine is called as a versatile machine. (6)

14. (a) (i) (1) Why is aluminium oxide preferred to silicon carbide in grinding steel? (6)

(2) Why is coarse grain and open structured wheel is preferred for stock removal grinding?

(3) What is the short coming of vitrified bond?

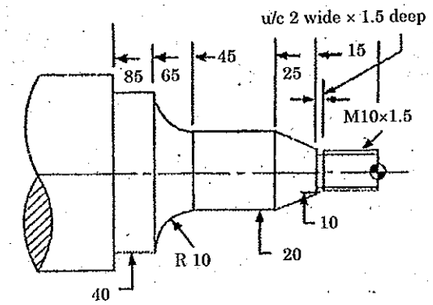
(ii) Explain with simple sketches explain the working of a broaching operation, also differentiate between the push and pull type broaching. (7)

Or

(b) (i) Define the term grinding ratio, G, and discuss the parameters which influence the grinding ratio. (7)

(ii) With simple sketch explain the working of a centre less external grinding operation. (6)

15. (a) Write the necessary part program for the part shown in figure. (16)



Alloy steel 500 × 50 (diameter in mm)

Or

(b) (i) Discuss the characteristics and capabilities of NC machines which makes it more versatile than the conventional machines.

(ii) What is the difference between point to point and continuous path in a motion control system?