

TME-504

IIII

Odd Semester Examination 2018-19

B.TECH. (ME) (Semester-V)

Manufacturing Science-II

Time: 03:00 Hours

Max. Marks : 100

Note: Attempt ALL the questions. Marks are shown against each question. Assume any missing data suitably.

1. Attempt any **FOUR** of the following: [5x4=20]
- (a) In an orthogonal cutting operation,  $t_o = 0.13$  mm,  $V = 120$  m/min,  $\alpha = 10^\circ$  and the width of cut = 6 mm. It is observed that  $t_c = 0.23$  mm,  $F_c = 500$  N, and  $F_t = 200$  N. Calculate the percentage of the total energy that goes into overcoming friction at the tool-chip interface.
  - (b) Explain what is meant by the term machinability and what it involves. Why does titanium have poor machinability?
  - (c) Let  $n = 0.5$  and  $C = 90$  in the Taylor equation for tool wear. What is the percent increase in tool life if the cutting speed is reduced by (a) 50% and (b) 75%?
  - (d) With a carbide tool, the temperature in a cutting operation is measured as 650K when the speed is 90 m/min and the feed is 0.05 mm/rev. What is the approximate temperature if the speed is doubled? What speed is required to lower the maximum cutting temperature to 480K?
  - (e) What are the major properties required of cutting-tool materials? Why?
  - (f) What are the different types of metal chips? Also mention the causes of the generation.

2. Attempt any **FOUR** of the following:

[5x4=20]

- (a) What are the different types of machining process that can be performed on a lathe machine? Explain any four.
- (b) A hole is being drilled in a block of magnesium alloy with a 10-mm drill bit at a feed of 0.2 mm/rev and with the spindle running at  $N = 800$  rpm. Calculate the material-removal rate and the torque on the drill.
- (c) Explain why the sequence of drilling, boring, and reaming produces a hole that is more accurate than drilling and reaming it only.
- (d) 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 lathe is equipped with a 12-kW 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.
- (e) A machining-center spindle and tool extend 250 mm from their machine-tool frame. Calculate the temperature change that can be tolerated in order to maintain a tolerance of 0.0025 mm in machining. Assume that the spindle is made of steel.
- (f) Explain the differences between the feed and cutting motion of lathe, milling, shaper and drilling.

3. Attempt any **TWO** of the following:

[10x2=20]

- (a) A surface-grinding operation is being performed on low-carbon steel with a wheel of diameter  $D = 250$  mm that is rotating at  $N = 4000$  rpm and a width of cut of  $w = 25$  mm. The depth of cut is  $d = 0.05$  mm and the feed rate of the work piece,  $v$ , is 1.5 m/min. Calculate the cutting force (the force tangential to the wheel),  $F_C$ , and the thrust force (the force normal to the work piece surface),  $F_N$ .
- (b) What is an abrasive? What are super abrasives? How is the size of an abrasive grain related to its number? Describe the structure of a grinding wheel and its features.
- (c) What is creep-feed grinding and what are its advantages? Define (a) friability, (b) wear flat, (c) grinding ratio, (d) truing, and (e) dressing.

4. Attempt any TWO of the following:

[10x2=20]

- (a) What are the different types of Arc Welding? Only mention the name. A welding operation will take place on carbon steel. The desired welding speed is around 20 mm/s. If an arc welding power supply is used with a voltage of 12 V. What current is needed if the weld width is to be 5 mm?
- (b) What are the differences between TIG and MIG? What is the purpose of flux? Why is it not needed in gas tungsten-arc welding?
- (c) Explain Oxy-acetylene gas welding. What are the different types of flames used in gas welding? Also mention the factors that affect the different flames.

5. Write short notes on any FOUR of the following:

[5x4=20]

- (a) A 200-mm-deep hole that is 30 mm in diameter is being produced by electrochemical machining. A high production rate is more important than machined surface quality. Estimate the maximum current and the time required to perform this operation.
- (b) A 20-mm-thick copper plate is being machined by wire EDM. The wire moves at a speed of 1.2 m/min and the kerf width is 1.6 mm. What is the required power? Note that it takes 1550 J to melt one gram of copper.
- (c) A cutting-off operation is being performed with a laser beam. The work piece being cut is 12 mm thick and 380 mm long. If the kerf is 2.4 mm wide, estimate the time required to perform this operation.
- (d) What is the difference between photochemical blanking and chemical blanking?
- (e) Explain the principle of abrasive water jet machining. Also mention the factors that affect the process.
- (f) What is EDM? Explain how the EDM process is capable of producing complex shapes.

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