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No. of Printed Pages—4

ME—504

B. TECH
FIFTH SEMESTER EXAMINATION, 2002-2003
MANUFACTURING SCIENCE - II

Time : 3 Hours

Total Marks : 100

Note :— Attempt ALL the questions.

1. (a) Distinguish in any THREE of the following :— (4×3=12)

- (i) Orthogonal and Oblique cuttings
- (ii) Machinability and Tool-life
- (iii) Crater wear and Flank wear of the tool
- (iv) Orthogonal and Normal rake systems of tool specification
- (v) Continuous and Discontinuous chips

(b) A tool shape with 8° back rake and 45° side cutting edge angle has to be used under orthogonal cutting condition. The tangential component of cutting force is 480 N and the normal component of cutting force (i.e. thrust component) is 240 N. The cutting velocity is 100 m/min. Calculate —

- (i) the required side rake angle so that cutting is orthogonal; (2)
- (ii) the kinetic coefficient of friction and; (3)
- (iii) energy consumed in friction per unit volume of material removal, if the chip reduction coefficient is 2.75. (3)

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OR

- (b) Draw Merchant's force circle diagram. Develop expression for power required in metal cutting and derive Merchant's shear angle relationship. (2+3+3=8)
2. (a) Answer any TWO of the following :— (5×2=10)
- How does a Turret lathe differ from a Capstan lathe ? What special tooling is associated with the turret lathe ?
 - What are the main differences between a shaper and a planer ? Which are the different drive mechanisms used in shaper ? Discuss any one in brief.
 - What is the function of indexing head as a milling machine attachment ? Giving example, explain its working.
 - With the help of a suitable sketch, describe the geometry of a twist drill and also explain, how drill sizes are designated.
- (b) Either cemented carbide or ceramic (oxide) may be used as tool materials while machining medium is carbon steel. The Taylor's tool-life equations are :
- for carbide tool $VT^{0.25} = 800$
 - for ceramic (oxide) tool $VT^{1.25} = 8000$
- Calculate the break-even speed above which ceramic (oxide) tool will give better tool-life. (10)
3. (a) Answer any TWO of the following :— (5 × 2=10)
- How are grinding wheels specified ? Clearly differentiate between grade and structure of a grinding wheel.

- (ii) What do you understand about any *Two* of the following :—
- (a) Lapping
 - (b) Down milling
 - (c) Reaming
- (iii) Discuss the wear mechanism of grinding wheel.
- (b) Show that the chip length, l_s , in horizontal surface grinding, using grinding wheel of diameter, D , is given by,

$$l_s = \left(1 + \frac{v}{V}\right) \sqrt{dD},$$

where V is the wheel speed, v is the work speed and d is the in-feed.

(10)

4. Answer any FOUR of the following :— (5×4=20)
- (a) Describe the types of flames obtained in an oxy-acetylene gas welding process. Also, give their applications.
 - (b) State the important functions of flux coatings of electrodes used in manual metal arc welding process. Also, give the designation of coated electrode used in manual metal arc welding.
 - (c) What are the differences between TIG and MIG welding processes ?
 - (d) What is 'arc blow' ? Explain the causes of arc blow. How is the arc blow problem in AC-welding taken care of ?
 - (e) Distinguish between Seam welding and Spot welding. Explain, whether dissimilar metals can be welded by resistance welding. If so, give the necessary precautions.

- (f) Giving suitable diagram, explain the atomic hydrogen welding process and also give its scope of application.
5. Answer any FOUR of the following :— (5×4=20)
- (a) What is Ultrasonic Machining process ? Giving suitable sketch, describe its working and also give its scope of application.
- (b) Explain the mechanics of material removal in Electro-Chemical Machining (ECM) process. If current of 1500 amp. is used, determine the volume rate of material removal from the copper block. Take the density of copper as 8.96 g/cm^3 , valency 1 and gram atomic weight as 58.93.
- (c) What is Electro-Discharge Machining (EDM) process ? Obtain the expression of material removal rate in EDM process in terms of the process parameters.
- (d) What is Explosive Welding process ? Describe, in brief, giving its field of applications.
- (e) What is Plasma Arc Welding process ? Giving suitable diagram, explain its working and also give its field of application.
- (f) What is Electron Beam Machining (EBM) process ? With the help of a suitable sketch, explain its working. Also, give its limitations and scope of application.