



BTS (C) – VI – 05 – 025 (K)

B.Tech. Degree VI Semester Examination June 2005

ME 604 TOOL ENGINEERING AND DESIGN (2002 Admissions)

Time: 3 Hours

Maximum Marks: 100

- I. (a) State the important properties that a cutting tool material should have. (6)
 (b) Draw a single point cutting tool and show the different angles on it on the basis of American system and German system. American system is commonly used in practice, why? (14)
- OR**
- II. (a) What is multipoint cutting tool? Draw a broach and indicate the tooth elements. (6)
 (b) What are the guidelines, which used for the selection of grinding wheel for tool sharpening and thread grinding? (10)
 (c) Compare the performance of cemented carbides and ceramics. (4)
- III. (a) Discuss the significance of Merchant's circle diagram. (6)
 (b) Briefly explain the stress and strain in the chip due to plastic deformation during machining. (6)
 (c) An experiment was conducted on a mild steel tube of 200 mm diameter and 3 mm thick. An orthogonal cut was taken with a cutting speed of 80 mm/min. and feed of 0.15 mm/rev. with a cutting tool having back rake angle of -10° . It was determined that cutting force = 150 kg., feed force = 40 kg., net horse power for cutting was 3 h.p. and chip thickness was 0.25 mm. Calculate the shear strain and strain energy per unit volume. (8)
- OR**
- IV. (a) Discuss the distribution of temperature generation in machining of free cutting mild steel with HSS tool during orthogonal cutting. (6)
 (b) What are the essential properties of cutting fluids? (4)
 (c) In an orthogonal cutting operation on a copper workpiece, following data has been obtained:
- | | | |
|-------------------------------|---|-----------------------|
| Back rake angle | - | 20° |
| Chip thickness before cutting | - | 0.12 mm |
| Width of chip before cutting | - | 3.75 mm |
| Width of chip after cutting | - | 4.1 mm |
| Chip length before cutting | - | 130 mm |
| Chip length after cutting | - | 50 mm |
| Shear stress of work material | - | 20 kg/mm ² |
| Coefficient of friction | - | 0.55 |
| Cutting speed | - | 30 mpm |
- Determine the shear force, cutting force, feed force and power consumption. (10)



(Turn Over)

- V. (a) What is machineability? What are the variables affecting machineability? Briefly explain.
- (b) During the machining of low carbon steel with HSS cutting tool, the following observations were made :
- | | | | |
|----------------------|---|-----|----|
| Cutting speed , m/mm | - | 40, | 50 |
| Tool life, minutes | - | 40, | 10 |
- Derive the $v - t$ relationship.

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(20)

OR

- VI. (a) Explain the mechanism of crater wear. (5)
- (b) What is tool life? List important tool life criteria? (5)
- (c) A cemented carbide tool is turning an alloy steel rod of diameter 50 mm and length 150 mm at a depth of cut of 3 mm and a feed of 0.4 mm/rev. The tool life equation is $vt^{0.2}=200$, where v is in m/min. and t is in min. The tool changing time is 1 min. and the time for loading and unloading of workpiece as well as advance and withdrawal of tool is 1 min. Initial set-up and idle time need not be considered. The tool regrinding cost is 3 units of cost and a new tool costs 100 units of cost. Tools can be reground a total of 10 times. Labour, overhead and depreciation is 15 units of cost per hour. What is the minimum cost per piece and the maximum production rate? (10)

- VII. (a) What are the functions of jigs and fixtures? (4)
- (b) Name the main elements of jigs and fixtures. Briefly explain each of them. (4)
- (c) What are the various location devices? Explain these with the help of suitable sketches. (12)

OR

- VIII. (a) Describe the milling fixtures. (5)
- (b) Enumerate the design principles common to jigs and fixtures. (15)

- IX. (a) Briefly explain the working principle of a mechanical press. What are the main advantages of mechanical presses over hydraulic presses? (5)
- (b) Define 'spring back' and explain how allowances may be made to compensate for its effect. (5)
- (c) Estimate the blanking force to cut a blank 25 mm wide and 30 mm long from a 1.5 mm thick metal strip, if the ultimate shear stress of the material is 450 N/mm^2 . Also determine the work done if the percentage penetration is 25% of material thickness. (10)

OR

- X. (a) Difference between a compound die and a progressive die. (6)
- (b) What are the various types of stripers? Explain their functions. (6)
- (c) A 37.5 cm long, 19 mm wide and 2.5 mm thick strip is to be bent in a V-bending die. Calculate the bending force necessary if the steel has 630 N/mm^2 tensile strength. What will be the bending force if we use U-bending die instead of V-bending die? (8)
