NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF INDUSTRIAL TECHNOLOGY

DEPARTMENT OF INDUSTRIAL ENGINEERING

PART V - MANUFACTURING PROCESSES-TIE 5103

FIRST SEMESTER EXAMINATION - NOVEMBER/DECEMBER 1999

Time Allowed: 3 Hours

Answer Question 1 and FOUR others

All questions carry equal marks

Qu.1 a) Tool life tests in turning yield the following data: 1) v=100m/min; T=10min 2) v=75m/min; T=30min.

i) Determine the n and C values in the Taylor tool life equation. [4]
ii) Based on your equation, compute the tool life for a speed of 90 m/min. [4]
iii) the speed corresponding to a tool life of 20min. [4]

b) i) What does the term "size effect" refer to in metal cutting? [2]
ii) Why are cutting fluid filter systems becoming more common and what are their advantages? [4]
iii) What is a tool-chip thermocouple? [2]

Qu. 2 a) An extruder has diameter 80mm and length 2.0m. Its screw has a channel depth = 5mm and flight angle = 18° and it rotates at 1 rev/sec. The plastic melt has a shear viscosity equal to 150Pas.

Determine the extruder characteristic by Computing Qmax and Pmax. [10]

b) i) The specified dimension for a certain injection moulded part made of nylon-6-6 is 100mm. Compute the corresponding dimension to which the mould cavity should be machined. The value of shrinkage for Nylon-6-6 is 0.020 in/in. [5]
ii) What are the significant differences in the equipment and operating procedures between injection moulding of thermoplastics and injection moulding of thermosets? [5]

Qu. 3 a) i) Give a detailed account of the three elements that contribute to the total production cycle time for one part in turning. [6]

ii) Describe the specific mechanisms that cause tool wear. [6]

b) The outside diameter of a cylinder made of titanium alloy is to be turned. The starting diameter is 500mm and the length is 1000mm. Cutting conditions are f=0.4mm/rev and d =3.0mm. The cut will be made with a cemented carbide tool whose Taylor tool life parameters are n=0.23 and c=400m/min Compute the cutting speed that will allow the tool life to be just equal to the cutting time for this part. [8]

Qu. 4 a) i) What are the principal methods used for producing metallic powders? Give a brief definition of each of these methods. [5]

ii) How is isostatic pressing distinguished from conventional pressing and sintering in PM? [5]

b) i) Distinguish between negative and positive moulds. Why is it useful to appreciate this difference? [4]

ii) The screw in the extrusion process is divided into a number of sections. Name and describe the functions of these sections. [6]

Qu. 5 a) i) What are the factors that can alter the amount of contraction experienced by a given polymer? [5]

ii) Give a detailed analysis of the three types of defects that can occur during the extrusion of plastics. [5]

b) i) For a spherically shaped particle, determine the surface area and volume of the maximum particle size that will pass through a screen with a 200 mesh count. [6]

ii) What is the aspect ratio of a cubic particle shape? [4]

Qu. 6 a) i) What are the factors on which the selection of feed in a machining operation should be based? [4]

ii) What are the criteria by which machinability is commonly assessed in a production machining operation? [4]

b) Turning is performed on a work material with shear strength of 250MPa. The following conditions are used v=3.0m/s, f=0.20mm/rev, d=3.0mm and rake angle = 7° in the direction of chip flow. The resulting chip ratio = 0.5

Determine i) shear plane angle [4]

ii) the shear force [4]

iii) cutting force [4]

End of Exam