BITS, PILANI- DUBAI
First Semester 2008-2009
Test 1 (Closed book)

Class: III Year Mech.
Course No.: ME C342
Time duration: 50 min.   Marks: 20

Course title: Production Techniques
Weightage: 10%

- Answer all the Questions
- Assume relevant data, if essential.

1.a   In a three point bending test performed on aluminium oxide specimen   [2]
        of size 25x5x2 mm with 20mm span, takes a maximum load of 400N
        before failure. What is the fracture strength of the material?

  b   A material has the following properties: UTS = 50,000 Pa and n=0.3.   [2]
        Calculate the strength coefficient.

2.   Determine the dimensions of a cylindrical riser to be used for casting   [4]
        an aluminium cube of sides 20cm. The volume shrinkage is 6%. The
        minimum volume of the riser should be at least 3times the shrinkage
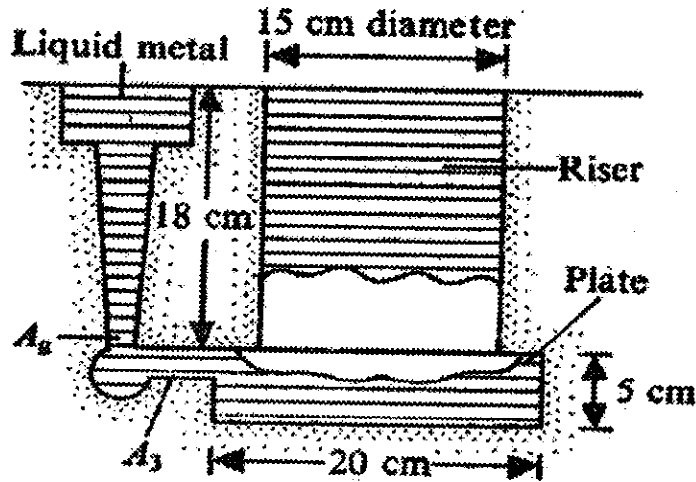   volume. **Hint: Area is to be minimized.**

3.

Fig. Q3

Determine the area Ag (Fig.Q3) such that the mould (20x20x5cm)
and the riser get filled up within 10sec after downsprue has been
filled. It should be noted that A_3>Ag since below the downsprue a flat
gate is attached to the casting. Neglect the frictional and orifice   [4]
effects.

[P-T-O]

1

4. Design the downsprue avoiding aspiration, shown in Fig.Q4 to deliver liquid cast iron (density = 7600 kg/m^3) at a rate of 10kg/s. Neglect the frictional and orifice effects.
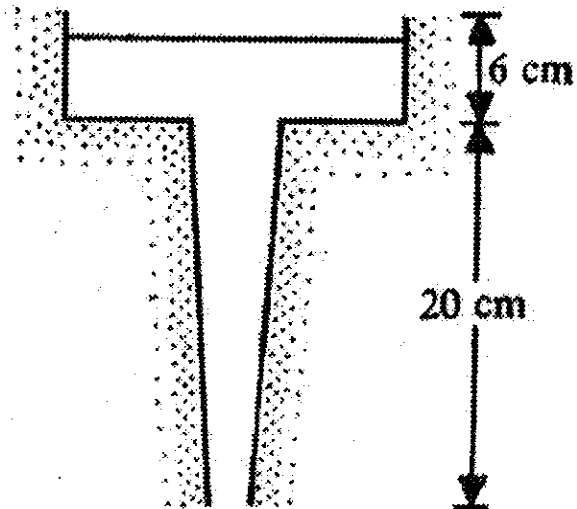
[4]

Fig.Q4

5. Define the following terms.
   (i)   Cold shut
   (ii) Sand scab
   (iii) Lean Manufacturing and
   (iv) Group Technology

[4]

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Class: III Year   Mechanical Engg.   Date:09.11.08
Course No.: ME C342   Course title: Production Techniques
Time duration: 50 min.   Marks: 30   Weightage: 15%

- Answer all the Questions
- Assume relevant data, if essential.
- Hand written class notes and text books are permitted

1. A cylindrical lead alloy billet of 40mm diameter and 100mm length is extruded to a final diameter of 20mm by using direct extrusion process. The average yield stress of the alloy is 12 N/mm^2. Estimate the maximum force required and the fraction of the total power lost in friction for this operation.   [6]

2. Consider a sheet metal of 50cm width and 7.5mm thickness. It is to be rolled to a thickness of 5mm in one pass using a mill whose steel rolls are of 80mm diameter, the value of $\mu=0.10$ and the average flow stress of metal is 300MPa. The rolls were made up of steel with E=200GPa.
a. Calculate the average roll pressure neglecting roll flattening
b. Estimate the minimum thickness to which the sheet could be rolled.   [6]

3. An angular bracket is to be made using 2mm thick sheet of mild steel. The fig.Q3 shows the geometry of the final part. There are 4 flat faces in the part, each of size 10cmx20cm. The three bends angles shown in figure are 60, 90 and 45°. Each bend has an outer radius (R) of 3mm. The bending allowance is given by α (R+K.t), α =bend angle, k=0.4 and t=thickness. Sketch the flat blank required to construct the bracket giving the exact dimensions.
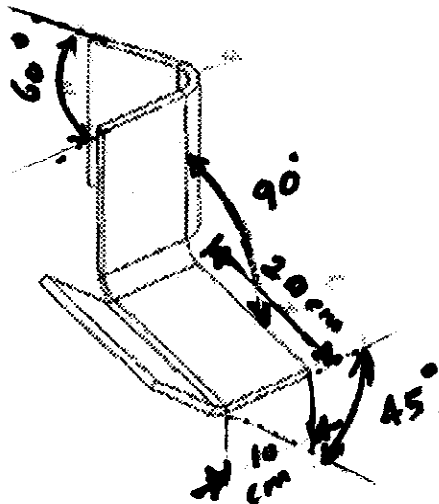
Fig. Q3

[6]

4. Data obtained during orthogonal machining of mild steel are listed below:
Shear strength = 400 MPa, back rake angle = 15°, cutting speed=150 m/min,
width of cut=1.5mm and depth of cut =0.3mm, chip thickness=0.5mm,
coefficient of friction =0.4. Construct the merchant's circle and determine
the six force components involved in machining. (use graph sheet) [8]

5. Derive an expression for optimum velocity considering maximization of [4]
profit rate in machining.

*****END****

BITS, PILANI- DUBAI
First Semester 2008-2009
Quiz1 (Closed book)

Class: III Year Mech.
Course No.: ME C342
Time duration: 20 min.   Marks: 10
Name of the student:

Date:
Course title: Production Techniques
Weightage: 5%
ID No:

1	Define Blind riser	
2	What is the use of Skim bob?	
3	What is meant by Concurrent engineering?	
4	State the expression used for grain size measurement using optical microscope.	
5	With sketch enumerate the methods for eliminating shrinkage cavity for L joint and T joint.	
6	Mention the range of temperature in terms of $T_{melting}$ for warm working.	

7	Define recrystallization	
8	State the expressions for shear stress and shear strain in torsion test	
9	Draw a creep curve and mention which part of the curve is important for design.	
10	Define strain ageing	

BITS, PILANI- DUBAI
First Semester 2008-2009
Quiz2 (Closed book)

Class: III Year Mech.
Course No.: ME C342
Time duration: 20 min.   Marks: 10
Name of the student:

Course title: Production Techniques
Weightage: 5%
ID No:

1   Draw the stress strain curve for a brittle material

2   What is the difference between brittle fracture and ductile fracture under SEM.

3   Name the sources for hydrogen embrittlement in manufacturing.

4   What is the effect of Mo in steel?

5   What is the difference between annealing and normalizing?

6   Draw the phase transformation diagram (Temp. Vs %C) to note the regions for different heat treatments.

7   Why draft allowance is provided for patterns? Mention its range.

8   State the expression for determining friction factor for laminar flow.

9   What is the effect of vena-contracta in castings?

10.   Define chaplet and core print.

Class: III Year Mech.
Course No.: ME C342
Time duration: 15 min.   Marks: 10
Name of the student:

Course title: Production Techniques
Weightage: 5%
ID No:

1. What is roll flattening? Show using a figure.

2. How will you estimate spring-back in bending?

3. How will you make tubes by extrusion process? Use a simple sketch.

4. Illustrate how the stress is distributed along the length of sheet metal when the thickness at the centre is more in rolling?

5. What is the relation between punch radius and die radius in deep drawing?

6. Specify the nature of stresses in different zones in deep drawing process.

7. Which phenomenon in stress-strain curve is related to spring-back? Illustrate the phenomenon using a curve.

8. What is centre bursting in metal forming? Why it is caused?

9. Write about alligatoring in metal forming. Use a simple sketch.

10. What is barreling? What is the reason for it?

BITS, PILANI- DUBAI
International Academic City, Dubai
First Semester 2008-2009
Comprehensive Examination – Closed Book

- Answer all the Questions
- Assume relevant data, if essential.

1. A cup of inside radius 40mm and thickness 5mm is to be drawn from a blank of radius 50mm. The shear yield stress and the maximum allowable stress in the material can be taken as 14 and $50N/mm^2$ respectively. Determine (i) the drawing force and (ii) the minimum possible radius of the cup which can be drawn from the given blank without causing a fracture. Take $\mu=0.1$ and $\beta=0.05$.   [7]

2. A paper clip is made of wire 1.2mm in diameter. If the original material from which the wire is made is a rod 18mm in diameter, calculate the longitudinal engineering and true strains that the wire has undergone during processing.   [7]

3. A 20x20x160mm copper plate is forged between two flat dies to a final size of 10x40x160mm. Determine the peak forging force assuming the coefficient of friction to be 0.2. The tensile yield stress of copper can be taken as $70N/mm^2$. Assume no strain hardening.   [7]

4. During the conventional turning of a mild steel bar of 75mm diameter with 5° rake angle tool, the observations made are:
Depth of cut =2mm; feed = 0.15mm/rev.; Job speed = 300 rpm; shear strength =$450N/mm^2$; μ=0.8. Estimate Fc and Power consumed following Lee's Shaffer's relation for shear angle.   [7]

5. A mild steel block is being drilled with a drill of 10mm diameter. Data obtained: helix angle = 30°, point angle =118°, feed =0.2 mm/rev and shear strength=$450N/mm^2$. Estimate the drilling torque and thrust force. Assume the coefficient of friction =0.75 and use Lee's Shaffer's relation to obtain shear plane angle.   [7]

6   A cylindrical impression with a diameter of 10mm and a depth of 1mm has to be made on a tungsten carbide surface. The feed force is constant and equal to 5N. The average diameter of the grit is 0.01mm. The tool oscillates with amplitude of 30μm at 20kHz. The slurry contains 1 part of abrasive to about 1 part of water. The fracture hardness of tungsten carbide work piece may be taken as 7000N/mm². Estimate the machining time.   [7]
Hint: No. of grains =1/2(Area of tool/Area of grit) and λ=5.

7   Determine the dimensions of optimum cylindrical riser attached to the side of a steel plate casting having the dimensions 25x12.5x5cm by using   [7]
caine's relationship:
X= (a/(Y-b)) + c, where a=0.1, b=0.03 and c=1.

8   Explain briefly with suitable sketch (wherever applicable) the following: [21]
    a. Selective laser sintering
    b. Pultrusion technique for FRP manufacturing
    c. Electron beam welding
    d. Ultrasonic welding
    e. Brazing
    f. Processing steps in powder metallurgy
    g. Thermo forming applied to plastics

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