These are the key words to the questions of January 2008

3 points each

1 A	2 C D	3 D	4 A	5 A
6 C	7 B	8 C	9 C	10 C

Vraag 11

a) Grain boundary sliding (no grain detoriation)

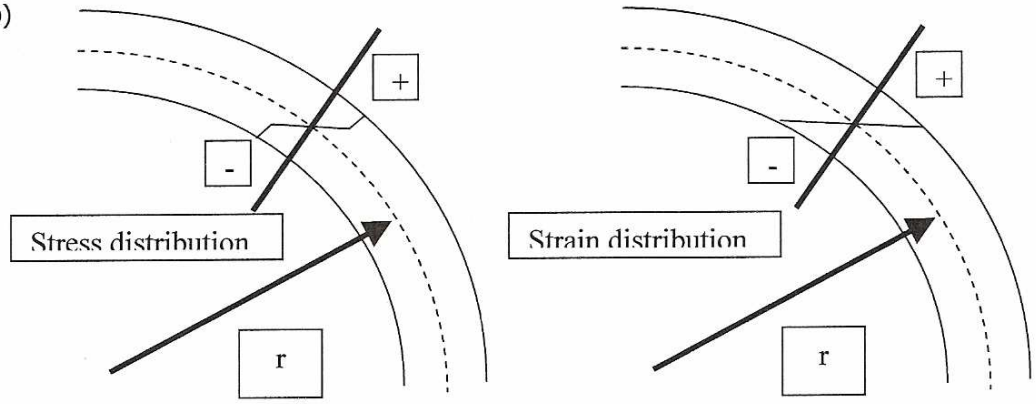
b) Large strains → complex products →less products (more integrated) → less tools required

c) Does not comply to the requirements for SP → often no stable grain structure → growth; recrystallisation
(dendrite grain structure no SP area in strain speed field)

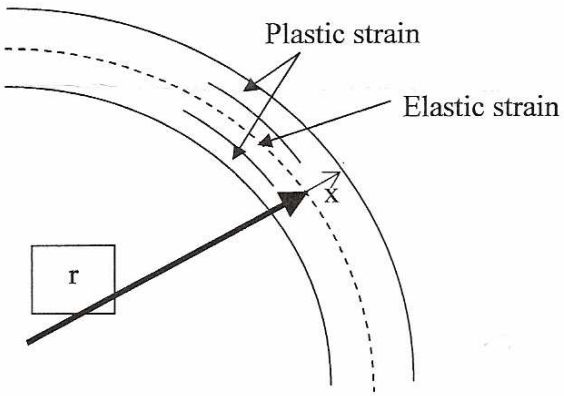
Vraag 12

a) isotropic, homogeneous, flat planes remain flat, congruent stress-strain curve, no internal stresses

b)



c)



d) Strain = ln((R+x)/R) = ln(1+x/R) = x/R or e = ((R+x)-R)/R = x/R
maximal x value is t/2 so maximal strain is t/(2R)

Vraag 13

a) very stiff → to minimise deflections → accuracy
accessible → to ease the assembly
strong → to carry all the loads (weight of parts)
compact → minimise required tool area → vertical

b) Truss structure
Tubular structures with large tubes Stiffness versus weight

c) hole-to-hole → all parts get their final holes before assembly
→ everything should fit
→ all steps should allow this high accuracy

d) easier for metals: small deviations can be overcome by plastic deformations
(composites → result in local fibre failure and delaminations)

Vraag 14
a) Number of parts, processed and handled as group
b) time interval between the delivery of two subsequent aircraft (important for all assembly activities)
c) bypass in the production line due to excess of work package (double)
d) stage in productions line where the same people perform the same tasks in the same amount of time
e) regression curve expressing the decreasing amount of time required for a particular task when performed over and over again.

Vraag 15
a) Heavy joints / thick joints – when tension loads are applied - easy dismounting
b) applied preload (tension) in the bolt reduces the amplitude stress in the bolt during fatigue → less fatigue damage
c) hole expansion to create residual compressive stresses at edge of hole. → fatigue initiation less critical

Vraag 16:
Production inspection
Why (possible answers):
- No disassembly of aircraft required.
- All parts and components are very accessible.
- Always sufficient space for robots at the inspection site.
- Large number of similar parts makes for cheaper inspection.

Vraag 17
a) complexity
b) start hollow or break and weld
c) higher temperature higher force, more expensive tooling

vraag 18
a) cost of an autoclave is a lot
b) gives higher fibre volume fraction, current engineering matrices need 'high' temperatures
c) thermoplastic means shorter product cycle, more composites are foreseen.
d) shortest path or geodesic path

vraag 19
a) coolant, lubrication (lower friction), was away chips
b) sharp (turning) versus blunt (grinding); toolangle positive (turning) negative (grinding)

vraag 20
a) plasma arc; EDM; machining; ....
b) EDM / Laser expensive machine; tools dependent on workpiece (EDM)
c) accuracy (EDM) / versatile in case other shape need to be created as well

vraag 21
investment casting: 1) create wax 'product' (pattern) 2) coat it with ceramic 3) melt wax 4) pour liquid metal 5) shake ceramic mould in pieces 6) done / can be done with trees of products.

Vraag 22
a) cavity in which molten material is present. Act as buffer. Casting
b) peel ply : layer of thin woven fabric to get other layers (bleeder...) of the product. Hand lay up
c) Rake angle: angle between chip side of the tool and vertical (on the work piece), can be positive and negative. / machining
d) void: empty space / casting / lay up
e) billet: start shape of metal / forging ....