EX/PG/METIM-MATE/T/116B/23,25/2017

M. TECH. MAT.ENGG. & M.MET ENGG (I. M.) 1st Semester, Examination, 2017

MATERIALS PROCESSING

Time: Three Hours

Full Marks: 100

Answer Question No's 9with any five from the rest

1. Describe Direct and Indirect Extrusion with figures. Show with reason how Direct and Indirect extrusion pressure varies with Ram travel.What is Dead Zone and Shaving? Why Al extrusion is very common? Why austenitic stainless steel Extrusion is difficult? Why Extrusion loads are lower than expected in compressive deformations? 16

2. Deduce how Angle of Bite (α), Maximum reduction (Δh_{max}) and projected length of the arc (L_p) are related to Roll parameters? Why hot rolling uses slotted rolls and cold rolling uses polished rolls? What is Roll Flattening? Why Friction Hill has round curve at the neutral point? What is importance of h_{min} in cold rolling? 16

3. If a material in plastic range is represented by (True Stress) $\sigma = K. \varepsilon^n$, then find out its Ultimate Tensile strength. What would be the energy required to draw the specimen up to that strength. How does Zenor-Hollomon parameter affect flow stress for different metals? How SFE influences 'Z'? Discuss how hot deformation differs with cold deformation? Explain Dynamic Recrystallization and Dynamic Recovery. 16

4. State Von mises and Tresca criteria for yielding. What is their relevance? How do those differ? StatePlane Strain and Plane stress conditions with examples. Deduce the stress required for yielding in Pure Shear, Compression, Plane Strain and Plane stress conditions. What is the relevance of Mohr's circle in yielding? 16

5. What is Principal stress? Why it is required? Using stress analysis deduce how Principal stress and maximum Shear stress are determined in Plain stress condition from the combination of normal stress and shear stress applied on two Cartesi

6. an co-ordinates, with transformation of angles. What is Mohr's circle? 16

7. What is Plastic, with examples? What are the advantages with respect to metals? Can you use plastics in making a bridge? Describe some of its common production methods. 16

8. What are Ceramics? How do these differ from Glass? Describe common methods of ceramics and glass processing useful for industries. 16

9. Describe different metal working processes [except Extrusion] with labelled sketches. Draw with explanations the nature of forging pressure with Ram travel during Close die forging. Showfor Close Die forging where forging pressure is high- with Flash or without Flash. 16

10. Explain : (Any Ten only) 2 x 10

i. When Red hot W is drawn into wires, the method is Cold Working but when Black lead is rolled that is Hot Working.

ii. Rolling uses Compressive load for deformation but rollers are anxious to increase tensional load by back and front tensions.

iii. Cold rolling needs high flow stress but uses small diameter rolls with the risk of roll bendingbut hot rolling needs low flow stress but uses large diameter rolls.

iv. Open Die Forging of heavy blooms needs low pressure but Close Die Forging of small jobs needs high pressure.

v. Flash is the wastage in case of Close Die forging production still Close Die forging designers prefer neither thinner flash nor smaller flash land.

vi. Cogging or Hot rolling of steel is known as problematic, but it operates on red hot, soft and ductile austenite while less ductile ferrite can be rolled in cold rolling mills.

vii. Al-foil production of μm-level thin section moves in automobile speed but thick section during extrusion of Al tends to operate in slower speed.

viii. Hydrostatic component of Principal stresses denote summation of Normal stresses meaning larger while deviotoric component denotes subtraction of Normal stresses meaning smaller, still engineers put more emphasis on latter during metal working.

ix. Thin W-filament production was easy even during II-World War but Thermo Mechanical Controlled Rolling of Low carbon steels ($C<0.01$) still causes rollers huge problem in 21st Century.

x. DuctileCopper can pose problem during working but brittle Bronze or high Zinc brass can be rolled easily to small thickness in hot condition.

xi. Percentage reduction ratio, 'r' in rolling or drawing generally records lower values less than 1, while extrusion ratio reports high values.

xii. During Pipe bending of soft Al too much precautions become necessary while for hard steel material onlylittle correction demands.