**Time: 3 hour** **Max Marks:80**

Note: 1. Q1 is compulsory
2. Solve any three from remaining
3. Assume suitable data wherever required

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| Q1 | **Solve any Four out of Six** | | 20 |
| | A. | Explain with diagram twinning mechanics of plastic deformation | |
| | B. | Classify Rolling processes. Write advantages and applications of rolling products | |
| | C. | Write short note on Average flow stress or mean flow stress | |
| | D. | Explain various defects in forging with their causes and remedies. | |
| | E. | List out Extrusion applications in standard shapes | |
| | F. | Define sheet metal bending process explain with sketches either V-bending or Edge Bending | |
| Q2 | A. | A block made of a perfectly plastic material with yield stress of 160 MPa in plain strain has dimensions 200 x 100 x 150 mm (b x hx w). Calculate the peak pressure P at the centre of the die. Also calculate minimum pressure at the edges. Assume sticking friction condition and Tresca's yield criterion. | 10 |
| | B. | Differentiate Hot and Cold working with sketches | 10 |
| Q3 | | | 10 |
| | A. | A strip with a cross section of 150mm x 6mm is being rolled with 20% reduction of area, 400mm diameter steel rolls before and after rolling, The shear yield stress of the material is 0.35 kN/mm$^2$ and 0.4 kN/mm$^2$respectively. Calculate (i) the final strip thickness, (ii) the average shear yield stress during the process, (iii) the angle subtended by the deformation zone at the roll Centre. Assume Coefficient of friction is 0.1 | 10 |
| | B. | Explain the effect of temperature and strain rate on metal forming. | |
| Q4 | A. | Determine drawing stress and velocity for a wire having entry diameter of 3.5mm and outer diameter 2.4mm Given characteristics of wire drawing as K =350MPa, $\mu$ = 0.08, n = 0.01, $\alpha$ =18degree and power required for drawing is 68Watt. | 10<br>10 |
| | B. | Explain tube drawing process. With neat sketches and explanation | |
| Q5 | A. | Explain following deep drawing operations,<br>i) Ironing<br>ii) Redrawing | 10<br>10 |
| | B. | Explain Electrohydraulic forming process with advantages, limitations, and applications | |
| Q6 | A. | Explain explosive forming process with advantages, limitations, and applications | 10<br>10 |
| | B. | Explain High Energy rate forming in the context of principle, application, advantageous and limitations | |

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