

Neat sketches and drawings are necessary (wherever applicable)
PART A and PART B should be answered separately in separate answer books

PART A (25 marks)

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|---|---|---|
| 1 | With a schematic, explain a resistance welding process for thermoset plastic sheets | 4 |
| 2 | While resistance welding of galvanized steel sheets, gold colored ring is observed at the face of electrodes. State the reasons for the same, and discuss the remedy for the same | 4 |
| 3 | Specify the power source used for GTAW process and explain its VI characteristics | 4 |
| 4 | Explain a) casting process for Al-5 wt% SiC b) welding process for the above mentioned metal based composites | 8 |
| 5 | In E 6015 electrode, 60 signifies ----- and in AISI304LN, LN signifies ----- | 1 |
| 6 | Role of titania in flux is ----- and the Spray forming of ceramic utilizes -----plasma. | 1 |
| 7 | Bull' s eye structure is seen in -----cast iron, shrink bob should be located ----- | 1 |
| 8 | Powder cutting utilizes ----- reaction, Oxygen lancing employs a----- tube. | 1 |
| 9 | Delayed cracking in welding is associated with ----- and He (shielding gas) is preferred to have hotter arc due to -----. | 1 |

PART B (15 marks)

- An aluminum billet with dimensions 100mmx30mmx20mm is compressed between two flat dies in an open die forging process at room temperature without any change in length. The true strain to fracture for the material is 0.8. The uniaxial flow stress of the material is given by $\sigma_0 = 400 \epsilon^{0.5}$ MPa. If the yield stress of the die material is 800 MPa, find out whether the dies will yield before the specimen fractures. Assume coefft. of friction to be 0.1. (4)
- A 3mm thick sheet is cold rolled to reduce the thickness to 1.5mm with no change in width using 600mm diameter rolls in multiple passes. Coefficient of friction between the rolls and the work piece is 0.05. If, the percentage reduction in thickness should not exceed 30% in any pass, calculate the minimum number of passes required and the exit sheet thickness for each pass. (4)
- Show the stresses acting on a small element of metal in the deformation zone in extrusion of a cylindrical billet through a conical die. (1)
 - The uniaxial flow stress of a material is given by $\sigma_0 = 450 \epsilon^{0.25}$ MPa. A 5mm diameter wire of this material is drawn through a conical die of die angle 12° at 1.5 m/sec to reduce the diameter to 4mm. Assume $\mu = 0.05$. Determine a) the three principal strains and the effective strain, b) the required drawing force and power and c) the minimum diameter of the wire that can be produced. (6)

$\frac{2}{5} \sigma_0 = \sigma_2$