

This question paper contains 3 printed pages.

3087

Your Roll No.

MEM (PE)

J

Paper – ME.603

WELDING PROCESS AND METALLURGY

Time : 3 hours

Maximum Marks : 100

*(Write your Roll No. on the top immediately
on receipt of this question paper.)*

Attempt any five questions.

All questions carry equal marks.

1. (a) Discuss the self-adjustment of welding arc and the type of power source, which will be selected for the purpose. 8
- (b) Explain the type of electrode with the BIS Code of ER4317H₁JX. 7
- (c) Can a 200 A @ 60% power source be used for 300 A? Comment. 5
2. (a) Explain with the help of figure the effect of shielding gas and electrode polarity on bead geometry in gas shielded arc welding processes. 8
- (b) Discuss the different ways of arc initiation in TIG welding. 7
- (c) What is keyhole welding technique? 5

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3. (a) Differentiate between Pulsed GMAW and Synergic GMAW. 5
- (b) What is electromagnetic Pinch effect? Discuss the salient features of flux cored arc welding process. 10
- (c) Discuss the principle and advantages of plasma arc cutting. 5

4. (a) Discuss the role of 'carbon equivalent' and de-oxidizers in assessing weldability. 10

- (b) A single full penetration weld pass is made on steel using the following parameters:

Arc voltage = 25 V

Welding current = 250 A

Welding speed = 5.0 mm/sec

Ambient temperature = 25 °C

Melting temperature = 1510 °C

Volumetric specific heat = 0.0044 J/mm³

Plate thickness = 5.00 mm

Heat transfer efficiency = 0.9.

Calculate the peak temperature at a distance of 1.5 mm from the weld fusion boundary. Also calculate the width of a HAZ corresponding to a peak temperature of 730 °C. 10

5. (a) Give the complete procedure for constructing a TTT diagram. (Isothermal decomposition of austenite.) 15

- (b) Explain the implications of above on weld metal. 5
6. (a) Describe the principles of—
- (i) Resistance welding
 - (ii) Electron beam welding. 8
- (b) What are the different properties that make aluminium welding different than welding steels? 6
- (c) Discuss the causes and cures of hot cracking in weld metal. 6
7. Write short notes on any *four* of the following:
- (i) Epitaxial grain growth
 - (ii) Effect of welding speed on weldpool shape
 - (iii) Eutectic, eutectoid and peritectic reaction
 - (iv) Classification of metal transfer
 - (v) Magnetic particle method of non-destructive tests
 - (vi) Types of residual stresses. 20