

Seat No.: \_\_\_\_\_

Enrolment No.: \_\_\_\_\_

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**DIPLOMA ENGINEERING – SEMESTER – V • EXAMINATION – WINTER 2016**

**Subject Code: 3355503**

**Date: 23 -11 -2016**

**Subject Name: Welding Metallurgy**

**Time: 10:30 AM TO 01:00 PM**

**Total Marks: 70**

**Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Each question carry equal marks (14 marks)

- Q.1** (a) Calculate cooling rate of weld joint from following data: **07**  
To = 25°C, Tc = 550°, t = 6 mm, f = 0.9, E = 25V, v = 8mm/sec.,  
I = 300 amps and  $\rho C = 0.0044 \text{ J/mm}^3, ^\circ\text{C}$ , K = 41 J/m.s ° C
- (b) Explain heat flow in and around weld metal with neat sketch. **07**
- Q.2** (a) Explain properties of HAZ. **07**  
(b) Draw neat sketch of TTT diagram use for welding and show different micro structure observed in it. **07**

OR

- (b) Prepare WPS from following data: **07**
1. Design code : ASME section VIII Div.1
  2. Specification standard : ASME section IX
  3. Base metal :10 mm thick SA 240 TP 304
  4. Welding process : GTAW
  5. Joint Design : Double “V”
  6. Filler metal : AWS ER-308-15 SFA 5.9 DIA 1.2 mm
  7. PWHT : NIL
  8. Shielding Gas used : Argon
- Q.3** (a) Explain the fusion zone and weld metal zone with the concept of phase diagram. **07**  
(b) Explain properties and applications of aluminium and its alloys. **07**

OR

- Q.3** (a) Explain concept and types of distortion with neat sketch. **07**  
(b) List different processes used for welding aluminium and its alloys. Explain any one with neat sketch. **07**
- Q.4** (a) Explain weldability of low carbon steel and its carbon equivalent. **07**  
(b) Explain carbide precipitation problem in welding of austenitic stainless steel and suggest its remedies. **07**

OR

- Q.4** (a) Calculate carbon equivalent from following given data : **07**  
Material: SA 240 TYPE304 plate austenitic stainless steel  
Chemical composition: C = 0.08%, Mn = 2%, Ph = 0.045%, S = 0.03%,  
Si = 1%, Ni = 8%, Cr =18%.  
Mechanical properties: Tensile Strength = 485 N/mm<sup>2</sup> Yield Strength = 205

Elongation = 40

(b) Explain schaeffler diagram with neat sketch. **07**

**Q.5** (a) Explain Mechanical residual stresses, Metallurgical residual stresses and Reaction stresses with neat sketch. **07**

(b) Explain characteristics of titanium. **07**

OR

**Q.5** (a) List different welding processes used for titanium welding. Explain plasma arc welding process. **07**

(b) Explain different methods for control of welding distortion. **07**

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