

GUJARAT TECHNOLOGICAL UNIVERSITY
DIPLOMA ENGINEERING – SEMESTER – V-EXAMINATION – WINTER 2015

Subject Code: 3355503**Date: 08/12/2015****Subject Name: Welding Metallurgy****Time: 10:30 AM TO 1:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Use of programmable & Communication aids are strictly prohibited.
5. Use of only simple calculator is permitted in Mathematics.
6. English version is authentic.

- Q.1** (a) Explain heat flow in and around weld metal with neat sketch. **07**
 (b) Explain different metallurgical effect of welding operation. **07**
- Q.2** (a) Write brief note on HAZ (Heat Affected Zone). **07**
 (b) Calculate cooling rate of weld joint from following data : **07**
 $T_o = 25^{\circ}\text{C}$, $T_c = 550^{\circ}\text{C}$, $t = 6 \text{ mm}$, $f = 0.9$, $E = 25 \text{ V}$, $v = 8 \text{ mm/sec.}$,
 $I = 300 \text{ Amps}$ and $\rho C = 0.0044 \text{ J/mm}^3, ^{\circ}\text{C}$, $K = 41 \text{ J/m.s } ^{\circ}\text{C}$
- OR**
- (b) Explain weldability of low carbon steel and its carbon equivalent. **07**
- Q.3** (a) Prepare WPS from given data. **07**
 i. Design code : ASME section VIII Div.1
 ii. Specification standard : ASME section IX
 iii. Base metal : 10 mm thick SA 515 GR 60
 iv. Welding process : SMAW
 v. Joint Design : Single “V”
 vi. Filler metal : AWS SFA 5.1 E-7018
 vii. PWHT : NIL
 (b) Explain schaeffler diagram with neat sketch. **07**
- OR**
- Q.3** (a) Calculate carbon equivalent from following given data : **07**
 Material: SA 240 TYPE 316 plate Austenitic stainless steel
 Chemical composition: C = 0.08%, Mn = 2%, Ph = 0.045%, S = 0.03%,
 Si = 1%, Ni = 10%, Cr = 16%, Mo = 2%, V = 1%
 Mechanical properties: Tensile Strength – 515 N/mm²
 Yield Strength = 170 Elongation = 40 %
 (b) Explain weldability of medium carbon steel. **07**
- Q.4** (a) Prepare WPS from following data : **07**
 i. Design code : ASME section VIII Div.1
 ii. Specification standard : ASME Section IX
 iii. Base metal :10 mm thick SA 240 TP 304
 iv. Welding process : GTAW
 v. Joint Design : Double “V”
 vi. Filler metal : AWS ER-308-15 SFA 5.9 Dia. 1.2 mm
 vii. PWHT : NIL
 viii. Shielding Gas used : Argon
 (b) Explain weldability of ferritic stainless steel. **07**

OR

- Q.4** (a) Explain carbide precipitation problem in welding of austenitic stainless steel and suggest its remedies. **07**
(b) Explain properties and applications of aluminium and its alloys. **07**
- Q.5** (a) Explain problem encountered in welding of aluminum and its alloys. **07**
(b) Explain mechanical residual stresses, metallurgical residual stresses and reaction stresses with neat sketch. **07**
- OR**
- Q.5** (a) Explain characteristics of Titanium. **07**
(b) Explain different methods to control welding distortion. **07**
