

B.E. (FULL TIME) DEGREE END SEMESTER EXAMINATIONS - APRIL / MAY 2011**MATERIALS SCIENCE AND ENGINEERING - VII SEMESTER - REGULATION 2004****12****ML 473 – WELDING METALLURGY**

Time : 3 Hours

Max. Marks : 100

ANSWER ALL QUESTIONS**PART – A (10 X 2 = 20 Marks)**

1. What is the importance of CE in metal joining operations? How do you determine the weldability of a steel material?
2. What is the purpose of 'preheating' in a metal joining operation?
3. What is 'edge preparation' and its importance in Welding?
4. Differentiate between DCRP and DCSP.
5. What is the meaning of 'weld decay'? How can it be prevented?
6. Define 'Arc blow'. How can it be avoided or minimized?
7. What are WPS and PQR and their importance in welding?
8. Differentiate between 'Brazing' and 'Soldering'.
9. Define a) Deposition rate b) HAZ
10. What are 'Residual Stresses' and how distortion can be avoided or minimized?

PART – B (5 X 16 = 80 Marks)

11. i) What are the various reactions that take place during welding? Discuss in detail (10)
a) Slag-metal reactions and b) Weld composition.
- ii) With suitable sketches describe V and U joints in welding process and what is the role (6)
played by joint geometry in this process?
- 12.a) i) Describe in detail with suitable sketches the metallurgical knowledge a 'welding (8)
engineer should possess in fusion welding.
- ii) Discuss in detail with suitable sketches the factors governing the thermal cycle during (8)
fusion welding.
- (OR)
- b) i) Discuss in detail the welding metallurgy of low alloy steels. (8)
- ii) What are the commonly encountered defects in welding? Explain in detail the causes (8)
and remedies to avoid the following defects.
A) Slag inclusions and b) Hot cracking
- 13.a) i) What are the problems one has to face in the welding of dissimilar metals? Explain (8)
in detail the factors to be considered while welding of such materials.
- ii) Discuss the welding behaviour of high strength Al-Zn-Mg alloys with specific (8)
reference to the problems encountered like
a) Gas metal reactions, b) Solidification cracking and their remedial actions.
- (OR)
- b) i) List the various defects that can occur in HAZ during welding of metals. Explain in (8)
detail the causes and remedies for the following defects.
a) Lamellar cracking b) Reheat cracking
- ii) Discuss in detail the welding characteristics of Ti and Ti base alloys. (8)

- 14.a) i) What are the problems that one can expect to face in welding of stainless steels? (8)
Explain in detail the metallurgy and welding of austenitic stainless steels with suitable sketches where necessary.
- ii) Discuss the weldability of Cu-base alloys. What are the metallurgical problems (8)
associated with these alloys? Explain in detail a) Gas-metal reaction and
b) Solidification cracking in these alloys.

(OR)

- b) i) Discuss in detail, the harmful effects of residual stresses and the methods you would (8)
adopt to eliminate or minimize them during welding.
- ii) What is the general classification of weldability tests? Explain in detail (8)
a) Hydrogen induced crack test and b) Service weldability tests.

- 15.a) i) Discuss in detail the problems associated with the welding of Ni-base alloys. Explain (10)
in detail a) Gas-metal reactions and b) Solidification cracking in Ni-base alloys

- ii) Discuss the metallurgy of brazing and soldering with specific reference to the capillary (6)
attraction and welding characteristics in brazing.

(OR)

- b) i) With suitable sketches, describe the factors that govern the transformation and micro (8)
structures of fusion weld metal.
- ii) Describe in detail the transformation and micro structure in HAZ in steel. (8)