

**ADVANCED WELDING TECHNOLOGY
(MECH 4141)**

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
any 5 (five) from Group B to E, taking at least one from each group.*

Candidates are required to give answer in their own words as far as practicable.

**Group – A
(Multiple Choice Type Questions)**

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) In which of the following welding processes, heat and pressure is applied on the joint but no filler material or flux is added?
(a) Arc welding (b) Resistance welding
(c) Gas welding (d) Thermit welding.
- (ii) For underwater welding, which of the following processes is not used?
(a) Electroslag welding
(b) Shielded metal arc welding (SMAW)
(c) Gas tungsten arc welding (GTAW)
(d) Gas metal arc welding (GMAW).
- (iii) In Ultrasonic welding the frequency range is generally
(a) 100 to 400Hz (b) 500 to 5000Hz
(c) 6000 to 20000Hz (d) 20000 to 50000Hz.
- (iv) In plasma arc welding the electrode is made of
(a) tungsten (b) copper (c) brass (d) steel.
- (v) Which welding process is used to join two thick plates in one single pass?
(a) Oxy-acetylene welding (b) Gas tungsten arc welding (TIG)
(c) Gas metal arc welding (MIG) (d) Electroslag welding.
- (vi) If the carbon percentage in a steel is 0.4% it is classified as
(a) low carbon steel (b) medium carbon steel
(c) high carbon steel (d) stainless steel.
- (vii) Which of the following defects occur when weld metal layer fail to fuse together?
(a) Inclusion of slag (b) Inadequate penetration
(c) Incomplete fusion (d) Porosity.

- (viii) In which testing process, interior defects of the weld joint can be detected?
(a) Magnetic particle testing (b) Dye penetration testing
(c) Radiographic testing (d) Tensile testing.
- (ix) Which carbon steel is easy to weld?
(a) Low carbon steel (b) Medium carbon steel
(c) High carbon steel (d) Stainless steel.
- (x) Medium carbon steel can be welded by
(a) flux shielded metal arc welding (b) oxy acetylene arc welding
(c) resistance welding (d) all of them.

Group – B

2. (a) Briefly explain the process FCAW and state any two major advantages of FCAW process. Also name any two process variables of FCAW.
(b) Explain the friction welding process and mention any two applications of it.
(3 + 2 + 2) + (3 + 2) = 12

3. (a) Two steel sheets of 1 mm thickness are resistance welded in a lap joint with a current of 10000 A for 0.1 second. The effective resistance of the joint can be taken as 100 micro ohms. The joint can be considered as a cylinder of 5 mm diameter and 1.5 mm height. The density of steel is 0.00786 g/mm³ and heat required for melting is 10 J/mm³. Find out welding efficiency.
(b) Write the advantages of TIG welding process.
8 + 4 = 12

Group – C

4. (a) Calculate the melting efficiency in the case of arc welding of steel with a potential of 20 V and a current of 200 A. The travel speed is 5 mm/s and the cross sectional area of the joint is 20 mm². Heat required to melt steel may be taken as 10 J/mm³ and the heat transfer efficiency as 0.85.
(b) Explain hot gas welding process and mention any two application of the same.
6 + (4 + 2) = 12
5. (a) Neatly sketch the setup of PAW. Write four applications of USW.
(b) Name any two major under water welding processes. What is sonotrode?
(4 + 4) + (2 + 2) = 12

Group - D

6. (a) Distinguish between three region of heat affected zone (HAZ) by their location and characteristics.
- (b) Identify the effect of arc voltage and welding speed on the characteristics of weldment.

6 + 6 = 12

7. (a) Select the proper welding technique and other parameters according to the weldability of low and medium carbon steel.
- (b) Configure a layout of robotic welding working cell in a manufacturing plant with proper diagram.

6 + 6 = 12

Group - E

8. (a) Analyze the reasons behind the welding defects (i) undercut (ii) slag inclusion with proper sketch of each defect.
- (b) Propose remedial measures to reduce the above mentioned defects.

(3 + 3) + (3 + 3) = 12

9. (a) Describe any one non-destructive testing methods of welding.
- (b) Write disadvantages of DP testing and ultrasonic testing of welded joints.

6 + 6 = 12