B.TECH / ME /7TH SEM/ MECH 4141/2017
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
<u>any 5 (five)</u> from Group B to E, taking <u>at least one</u> 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 Ultrasonic Welding the frequency range is generally
(a) 100 to 400Hz   (b) 500 to 5000Hz
(c) 6000 to 20000Hz   (d) 20000 to 50000Hz.

(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) Which of the following welding processes consists of minimum heat affected zone (HAZ)?
(a) Metal Inert Gas Welding   (b) Shielded Metal Arc Welding
(c) Laser Beam Welding   (d) Ultrasonic Welding.

(iv) Carburizing flame is used for welding of
(a) Mild steel   (b) Aluminium   (c)Lead   (d) Copper.

(v)   Thermit welding is a form of
(a) Resistance welding   (b) Gas welding
(c) Fusion welding   (d) Forge welding.

(vi) Electron beam welding is to be carried out in
(a)Vacuum   (b) Shielding gas environment
(c)Open air   (d) A pressurised inert gas chamber.

(vii) Welding process using non-consumable electrode is
(a) MMA welding   (b) MIG welding
(c) TIG welding   (d) ES welding.

(viii) In DC welding, the straight polarity (electrode negative)results in
(a) Less heating of work piece   (b) Smaller weld pool
(c) Lower penetration   (d) Lower depositing rate.

(ix) Grey cast iron is best welded by
(a) Gas welding   (b) Resistance welding
(c) Arc welding   (d) All of these.

(x)   In which testing process, interior defects of the weld joint can be detected?
(a) Tensile testing   (b) Dye penetration testing
(c) Radiographic testing   (d) Magnetic particle testing.

Group - B

2. (a) What do you mean by polarity in dc arc welding? With proper sketch, explain the advantages of choosing different polarities.

(b) What do you understand by 'friction stir welding'? Mention its application and limitation.

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

3. (a) What are the differences among the autogenous, homogeneous and heterogeneous joining processes? Give example of each process.

(b) The voltage-length characteristic of a direct current arc is given by $E = (20 + 40l)$ V, where l is the length of the arc in cm. The power source characteristic is approximated by a straight line with an open circuit voltage = 80 V and a short circuit current = 1000 A. Determine the optimum arc length and the corresponding arc power.

(3 + 3) +6 = 12

Group - C

4. (a) Give the characteristics of Underwater welding. Discuss some common problems encountered in Underwater welding.

(b) With proper sketch explain principle and operation of Laser Beam welding. Write its advantages and limitations.

(3 + 3) + (4 + 2) = 12

5. (a) Explain with suitable sketches, the non-transferred arc & transferred arc Plasma Arc Welding Processes.

   (b) Differentiate between Plasma Arc Welding & TIG Welding.

   6 + 6 = 12

Group - D

6. (a) Describe with suitable sketch the formation of Heat Affected Zone (HAZ) in welding.

   (b) Define weldability of material and the factors on which weldability depends.

   6 + 6 = 12

7. (a) Describe the methods used for welding aluminium and its alloys.

   (b) Why are preheating, post-heating and normalizing essential in welding of certain materials? Explain clearly.

   6 + 6 = 12

Group - E

8. (a) What is meant by residual stress in the weld structure? Also mention the major factors responsible for residual stresses. Give suitable diagram.

   (b) List various techniques of Non Destructive Testing of welded joints. Explain the working principle of any one technique with proper diagram.

   (2 + 4) + (2 + 4) = 12

9 .(a) Discuss about arc blow with its causes and remedies.

   (b) Write down the uses of jigs and fixtures in welding.

   (c) Two steel sheets of 1.0 mm thickness are resistance welded in a projection welding with a current of 3000 A for 0.005s. 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/mm^3 and heat required for melting steel is 10J / mm^3. Calculate heat required for melting and heat loss to the surroundings.

   3 + 4 + 5 = 12