ADVANCED WELDING TECHNOLOGY
(MECH 3222)

Time Allotted : 2½ hrs **Full Marks : 60**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 4 (four) from Group B to E, taking one from each group.

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

Group – A

1. Answer any twelve: **12 × 1 = 12**

Choose the correct alternative for the following

(i) Metal oxide and aluminium powder is used in
(a) Diffusion welding (b) Laser beam welding
(c) Submerged arc welding (d) Thermit welding.

(ii) Which gasses are used in TIG welding?
(a) Carbon di-oxide and Nitrogen (b) Argon and Neon
(c) Argon and Helium (d) Helium and Neon.

(iii) An example of non destructive test in welding is
(a) Tensile test (b) Impact test
(c) Fatigue test (d) Radio graphic test.

(iv) Which of the following uses a non consumable electrode?
(a) GTAW (b) GMAW (c) MMAW (d) SAW.

(v) If carbon percentage in steel is less than 0.30%, then it is classified as
(a) low carbon steel (b) medium carbon steel
(c) high carbon steel (d) composite carbon steel.

(vi) With the increase in welding speed, heat in per unit length of weld will
(a) increase (b) decrease
(c) remain same (d) be undetermined

(vii) A spherical robot has the following motions
(a) 2 rotational-1 linear (b) 1 rotational-2 linear
(c) 3 rotational (d) 3 linear.

(viii) Weld bead depends on the following
(a) current (b) speed (c) voltage (d) all of them.

(ix) Which one of the following is not a welding jigs or fixtures?
(a) C-Clamp (b) Turn table (c) Positioner (d) Screw Jack.

(x) The residual stress generated due to welding can be removed by
(a) Pre heating (b) Post heating
(c) Both (a) and (b) (d) Keeping slow welding speed.

Fill in the blanks with the correct word

(xi) The depth of penetration of arc will _____, if welding current is decreased.

(xii) The three dimensional shape that defines the boundaries that the robot manipulator can reach is called _____.

(xiii) Oxygen cylinder colour is _____.

(xiv) In D.C Welding at _____ pole will have more heat.

(xv) In reducing flame _____ gas is more in volume.

Group - B

2. (a) Explain the reason behind coating the electrodes that are used in SMAW.
[(CO1)(Understand/LOCQ)]

(b) Sketch a diagram of reverse polarity and explain when it is preferred.
[(CO1)(Apply/IOCQ)]

(c) List three types of VI characteristics that are used in arc welding machines.
[(CO2)(Remember/LOCQ)]

3 + 3 + 6 = 12

3. (a) Two steel sheets of 1.0 mm thick 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. Density of steel is 0.00786 g/mm^3 and heat required for melting steel be taken as 10 J/mm^3. Find the melting efficiency.
[(CO2)(Evaluate/HOCQ)]

(b) Draw a diagram of a V grooved region and mark face, root, depth of penetration and HAZ. *[(CO1)(Apply/IOCQ)]*

6 + 6 = 12

Group - C

4. (a) Identify any three types of plastic welding processes and Briefly explain any one of them. *[(CO1)(Understand/LOCQ)]*

(b) Draw the diagram of USW and demonstrate the working principle.
[(CO3)(Apply/IOCQ)]

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

5. (a) Sketch the diagram of non transferred plasma arc welding process.
[(CO3)(Apply/IOCQ)]

(b) Demonstrate explosive welding very briefly with diagram. *[(CO3)(Analyze/IOCQ)]*

(3 + 3) + 6 = 12

Group - D

6. (a) Compare between grain growth and grain refined region of HAZ. *[(CO4)(Analyze/IOCQ)]*

   (b) Identify the effect of welding voltage on the characteristics of weldment. *[(CO4)(Understand/LOCQ)]*

6 + 6 = 12

7. (a) Explain any four objectives and name any two methods of pre heating. *[(CO4)(Understand/LOCQ)]*

   (b) Propose a suitable method of welding for stainless steel. *[(CO5)(Create/HOCQ)]*

(4 + 2) + 6 = 12

Group - E

8. (a) Explain the working principle of any two types of welding fixtures. *[(CO5)(Understand/LOCQ)]*

   (b) Propose a welding-specific robotic work cell arrangement using a diagram. *[(CO5)(Create/HOCQ)]*

6 + 6 = 12

9. (a) Explain spatter and mention its remedies. *[(CO6)(Understand/LOCQ)]*

   (b) Name any three example of each of the destructive test and non destructive test performed to test welded joints. *[(CO6)(Remember/LOCQ)]*

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

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	46.88	34.37	18.75

Course Outcome (CO):

At the end of the course, a student will be able to

1. Compare the processes of common welding technology
2. Evaluate process parameters in different welding processes.
3. Demonstrate critical and precise welding processes and their setups.
4. Analyze the metallurgical properties after welding and select post welding heat treatments, ifrequired.
5. Explain the weldability of different materials and implement the knowledge of welding fixtures and automation in different welding processes.
6. Identify the welding defects, its causes and remedial measures.

**LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question.*