

Ex/PG/MetIM/T/123A/2025

M.E. METALLURGICAL & MATERIAL ENGINEERING FIRST YEAR 2nd SEMESTER
EXAMINATION - 2025

Subject: Joining of Materials

Time : Three Hours

Full Marks: 100

Answer Q.9 and any four questions from the rest.

10x2

CO-1 Q.1

- i). Define autogeneous welding process with example.?
- ii). How arc is generated and become self-sustaining in arc welding?
- iii). Why heat input is an important parameter in fusion welding?
- iv). Why fusion is not a prerequisite for welding metals?
- v). What are the factors affecting on welding?
- vi). What are the benefits of slag formation in welding?
- vii). Why inert gas is used in welding?
- viii). What is the 'heat affected zone' in welding?
- ix). What is dilution in welding?
- x). What is meant by weld bead

or

CO-1

Q.2

2+6+12

- i). Mention the different arc welding power sources.
- ii). Differentiate DCSP and DCRP for welding
- iii). Explain an arc voltage –arc current characteristics in details.

CO-2

Q.3

10+6+4

- i). Discuss with a net sketch the shielded metal arc welding process.
- ii). Describe the various steps of manufacturing a complete SMAW welding electrode starting from wire drawing to electrode packing.
- iii). Discuss the important functions of flux coating.

or

CO-2 Q.4

2+10+8

- i). Mention the important process variables affecting the MIG welding process.
- ii). What are different types of metal transfer in MIG welding and briefly describe any one.
- iii). Write the main advantages and limitations of MIG welding.

[Turn over

CO-2

Q.5

10+10

- i). Explain the fundamentals of resistance welding
- ii). Describe the construction and working of seam welding with their advantages and limitations.

or

CO-2

Q.6

10+6+4

- i). Explain the working principle of a solid state welding process and discuss with a net sketch of any one type of such process.
- ii). Discuss the specific advantages and drawbacks of a solid state welding process over the fusion welding process.
- iii). Mention the important factors affecting the strength of solid state welding joint.

CO-3

Q.7

10+5+5

- i). Define weldability and how it can be evaluated? Write the various effects of alloying elements on weldability.
- ii). Two steel plates are to be arc welded using a linear source with open circuit voltage of 60 V and short circuit current of 120 Amp. The arc length is 4mm and welding speed is 3 mm/s. Heat transfer efficiency is 0.8. If the arc length – voltage characteristic is given by $V = 21 + 2L$. The net heat input in J/mm
- iii). Arc length- voltage characteristic for a welding operation is given by $V = 20 + 4L$. If the arc length varies between 4mm to 6mm and welding current varies between 450 amp to 550 amp. Assuming linear power source, calculate (a) Open Circuit Voltage (b) Short Circuit Current.

or

CO-4

Q.8

6+8+6

- i). Differentiate between the soldering, brazing and braze welding.
- ii). Mention the various soldering processes. Explain the typical soldering steps for achieving good solder joints.
- iii). Define adhesive bonding and mention the various steps are involved in joining materials by adhesive bonding process.

CO-5 & CO-6

Q.9

10x2

- Short notes:
- i). Common welding defects
 - ii). Radiographic tests of Weld metals