GIET UNIVERSITY, GUNUPUR – 765022

B. Tech (Seventh Semester – Regular) Examinations, November – 2023

BPEME7011 - Advanced Welding Technology

(Mechanical)

Time: 3 hrs   Maximum: 70 Marks

Answer ALL Questions
The figures in the right hand margin indicate marks.

PART – A: (Multiple Choice Questions)   **(1 x 10 = 10 Marks)**

Q.1. Answer **ALL** questions   [CO#]   [PO#]

a. Which of the following welding can be performed with higher arc length   CO1   PO1
   - (i) SAW
   - (ii) TIG
   - (iii) MIG
   - (iv) SMAW

b. At the hottest part of the arc, what can be the maximum temperature   CO2   PO1
   - (i) 10000 °C
   - (ii) 20000 °C
   - (iii) 14000 °C
   - (iv) 25000 °C

c. Power factor of a spot-welding machine is expected to be   CO3   PO1
   - (i) Unity
   - (ii) 0.8 lagging
   - (iii) 0.8 leading
   - (iv) 0.3 to 0.5 lagging

d. Which type of transformer used in AC welding   CO3   PO1
   - (i) Equal turns ratio
   - (ii) Ferrite core type
   - (iii) Step up type
   - (iv) Step down type

e. As per IS 815:1974 of electrode designation PXXXXXXS, the 1st X denotes   CO1   PO1
   - (i) type of current
   - (ii) type of coating
   - (iii) weld strength
   - (iv) weld position

f. Which region is not part of the arc characteristic.   CO3   PO1
   - (i) Dropping zone
   - (ii) Rising zone
   - (iii) Flat zone
   - (iv) Initiation zone

g. What is upper range of frequency used in ultrasonic welding   CO4   PO1
   - (i) 10000 Hz
   - (ii) 20000 Hz
   - (iii) 60000 Hz
   - (iv) 80000 Hz

h. Electron beam welding is carried out in?   CO4   PO1
   - (i) Partial field chamber
   - (ii) Inert atmosphere
   - (iii) Partially vacuum
   - (iv) Vacuum

i. Where maximum heat loss to the surrounding takes place   CO1   PO1
   - (i) Cathode drop zone
   - (i) Anode drop zone
   - (iii) Plasma drop zone
   - (ii) None of these

j. Which of the following is not a basic characteristic of welding power source   CO3   PO1
   - (i) Open circuit voltage
   - (ii) Power factor
   - (iii) Short circuit current
   - (iv) Duty cycle

PART – B: (Short Answer Questions)   **(2 x 10 = 20 Marks)**

Q.2. Answer **ALL** questions   [CO#]   [PO#]

a. Plot the graph between arc voltage and arc length for SMAW and MIG.   CO1   PO1

b. During MIG welding operation, the electrode diameter used is 2 mm, wire feed rate is 3 m/min, total area of weld bead is 31.4 mm^2. Evaluate the welding speed (mm/sec) used in the welding process.   CO1   PO2

c. Differentiate between AC power source and DC power source.   CO3   PO1

		CO#	PO#
d.	Explain briefly self-regulating type power source.	CO3	PO1
e.	Classify the coating material based on its application.	CO1	PO1
f.	Differentiate between short circuit transfer and dip transfer.	CO1	PO1
g.	Describe the advantages of FSW process over conventional welding.	CO4	PO1
h.	Classify the types of lasers generally used in laser welding process.	CO4	PO1
i.	Explain the significance of grain growth zone in welding metallurgy.	CO2	PO1
j.	SMAW have higher efficiency than GTAW, justify.	CO1	PO1

PART – C: (Long Answer Questions)   (10 x 4 = 40 Marks)

Answer **ALL** questions   Marks   [CO#]   [PO#]

3. a. Explain the effect of polarity on welding; with neat sketch explain briefly DCEN process. **10**   CO1   PO1

(OR)

   b. Explain the importance of HAZ and categorized it with respect to temperature. **10**   CO2   PO1

4. a. The arc length-voltage characteristics of a DC arc is given by the equation $V = 24 + 4l$ where V is the arc voltage and l is arc length in mm. The static volt-ampere characteristic of the power source is approximated by a straight line with no load voltage of 80 volts and the short-circuit current of 600 amperes. Determine the optimum arc length for maximum power. **8**   CO3   PO2

   b. Evaluate the total power for the above problem. **2**   CO3   PO2

(OR)

   c. Explain the static characteristics of constant current type welding power source with a neat sketch. **10**   CO3   PO2

5. a. Explain the role of flux and shielding gases during welding. **5**   CO1   PO1

   b. In an arc welding process, the voltage and the current 25 volts and three 300 A respectively. The arc heat transfer efficiency is 0.85 and welding speed is 8 mm/sec. Evaluate the net heat input. **5**   CO1   PO2

(OR)

   c. Explain the importance of melting rate evaluation. **5**   CO1   PO1

   d. The net heat supplied in arc welding process is 1400 J/mm. The melting efficiency is 40%. The welding speed is 6 mm/sec. The rate of melting is 20 J/mm^3. Calculate the area of the joint in (mm^2) that can be obtained. **5**   CO1   PO2

6. a. With a neat sketch, explain the working of FSW process. Describe the advantages and limitation of FSW process. **10**   CO4   PO1

(OR)

   b. Explain working principle, advantages and limitations of ultrasonic welding process. **10**   CO4   PO1

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