BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Metal Construction Skills

Session: 2021-22 (Summer Semester)

B. Voc. Program, 3rd Semester,

1st In-Sem. Examination

Course Code: MCS1304 **Time: 1 Hour**

Course Name: Advanced Welding **Max. Marks: 20**

Instruction:

1. Attempt all questions.
2. Use of Calculators is prohibited.
3. Section A contains 05 Questions. Each question carries 1 Marks.
4. Section B contains 03 Questions. Each question carries 2 Marks.
5. Section C contains 03 Questions. Each question carries 3 Marks.

Section – A

05X01 = 05 Marks

Q1. Which is not a factor of cold cracking:

a) Presence of hydrogen
b) Susceptible microstructure
c) Tensile Strength
d) None of the Above

Q2. ISO standard position for overhead fillet weld:

a) PA
b) PB
c) PC
d) PD

Q3. What is full form of WPS?

a) Welding Performance Specification
b) Welding Procedure Specification
c) Welder Performance Specification
d) None of the Above

Q4. What are the percentage of carbon in low alloy steels?

a) Less than 0.2%
b) More than 0.2%
c) Equal to 0.2%
d) All of the Above

Q5. Which is a Stainless Steel type:

a) Austenitic
b) Low alloy
c) Ferritic-Martensitic
d) None of the Above

Section – B

03X02 = 06 Marks

Q6. What is baking of an electrode?

Q7. What do you understand by WPS?

Q8. Write short note on Martensitic stainless steel.

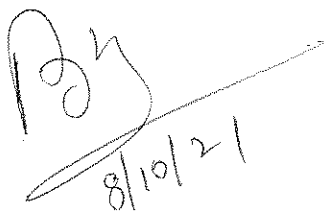
Section – C

03X03 = 09 Marks

Q9. Explain, Procedure Qualification Record and Welder Performance Qualification.

Q10. Explain, Ferritic stainless steels and Austenitic steels.

Q11. Write down the official parts of WPS or PQR Form.



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Answer key

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Section – A

05X01 = 05 Marks

Q1. Which is not a factor of cold cracking?

a) Presence of hydrogen
b) Susceptible microstructure
c) Tensile Strength
d) None of the Above

Ans. d)

Q2. ISO standard position for overhead fillet weld:

a) PA
b) PB
c) PC
d) PD

Ans. d)

Q3. What is full form of WPS?

a) Welding Performance Specification
b) Welding Procedure Specification
c) Welder Performance Specification
d) None of the Above

Ans. b)

Q4. What are the percentage of carbon in low alloy steels?

a) Less than 0.2%
b) More than 0.2%
c) Equal to 0.2%
d) All of the Above

Ans. a)

Q5. Which one is a type of Stainless-Steel?

a) **Austenitic**
b) Low alloy
c) Ferritic-Martensitic
d) None of the Above

Ans. a)

Section – B

03X02 = 06 Marks

Q6. What is baking of an electrode?

Ans. The coating of the electrode is **having the tendency to absorb moisture**. Baking is the process of removing moisture from the electrodes, with the help of heat, thereby reducing the level of dissolved H2 in the weld metal which is prone to make delayed cracking in the weld metal.

Q7. What do you understand by WPS?

Ans. A Welding Procedure Specification (WPS) is **the formal written document describing welding procedures**, which provides direction to the welder or welding operators for making sound and quality production welds as per the code requirements. A WPS is supported by a Procedure Qualification Record (PQR or WPQR)

Q8. Write short note on Martensitic stainless steel.

Ans. Martensitic stainless steels contain between 12 and 18% chromium with 0.15–0.30% carbon. Because of their composition, these steels are capable of air hardening and thus special precautions should be taken during welding to overcome possible cracking.

Section – C

03X03 = 09 Marks

Q9. Explain, Procedure Qualification Record and Welder Performance Qualification.

Ans. **PROCEDURE QUALIFICATION RECORDS (PQR)**

All WPSs start with a PQR. It is a record of the test. It **DOES NOT have any ranges**. It lists the actual values recorded during the welding of a test piece. It proves the welding process. Then using the essential variables (ranges) from the relevant code/standard a WPS can be generated from this record of actual values.

PQR is essentially the 'actual' method that is used to create and test the welds to ensure they meet all applicable requirements.

The test procedures and final results are documented in the PQR. If the PQR meets the set standards of the welding world, then it will serve as the foundation on which one or more WPSs are drafted.

Even though a PQR eventually leads to a WPS, it is important for welders to have knowledge of both documents. In critical applications and in mechanised and automatic welds welders can refer to the PQR and replicate the actual values used in the test weld, this removes all the variation.

On face value, these documents look very similar but serve completely different purposes. The best way to think of it is;

- PQR is an office document
- WPS is a workshop document

Both are necessary in most cases. The PQR supports the WPS as evidence of qualification.

While WPS and PQR are used to define and prove the welding process.

WQT/WPQ is used to test the actual welder. Is the welder able to produce a sound weld;

- With a particular welding process i.e. GMAW or GTAW
- In a given position Horizontal, Vertical or Overhead
- On a particular joint configuration Butt weld or Fillet weld.

WELDER PERFORMANCE QUALIFICATIONS (WQT/WPQ)

A WQT does not test the mechanical properties, it looks at weld soundness only in most cases.

A Welder Qualification Test is recorded on documentation known as a test certificate that details the ranges that welder is qualified. Ranges or essential variables for WQT are not always the same as those for a WPS. An example would be that is a welder can weld in the overhead position (more difficult) it is logical they be qualified in the flat position (less difficult).

The welder completes a test coupon under supervision following a WPS. The weld is then tested using the method prescribed in the relevant standard.

The testing always includes as a minimum visual examination but may also require;

1. Bend tests – root/face or sides
2. Macro test – cross section view of weld
3. Fillet weld break test
4. Nick Break
5. Radiographic examination
6. Ultrasonic examination

Q10. Explain, Ferritic stainless steels and Austenitic steels.

These steels, which contain 12–30% chromium with a carbon content below 0.10% do not exhibit the good weldability of the austenitic types. They become fully ferritic at high temperatures and undergo rapid grain growth, which leads to brittle, heat affected zones in the fabricated product. No refinement of this coarse structure is possible without cold working and recrystallization. In addition, austenite formed at elevated temperatures may form martensite upon transformation, which can cause cracking problems. The brittleness and poor ductility of these materials have limited their applications in the welded condition. Ferritic stainless steels are also subject to intergranular corrosion as a result of chromium depletion from carbide precipitation. Titanium and niobium stabilised ferritic steels and steels with extra low interstitials (i.e. C,N) are available to overcome this problem.

As this material has a coefficient of expansion lower than that of carbon manganese steels, warpage and distortion during welding is considerably less. They are magnetic, however, and therefore subject to magnetic arc blow. Ferritic stainless steels cannot be hardened by conventional heat treatment processes.

Austenitic stainless steels

This is by far the largest and most important group in the stainless-steel range. These steels, which exhibit a high level of weldability, are available in a wide range of compositions such as the 19/9 AISI 304 types, 25/20 AISI 310 types and 19/12/2 AISI 316 types, which are used for general stainless steel fabrications, elevated temperature applications and resistance to pitting corrosion respectively.

As the name implies the microstructure of austenitic stainless steel consists entirely of fine grains of austenite in the wrought condition. When subjected to welding, however, a secondary ferrite phase may be formed on the austenite grain boundaries, in the heat affected zone and in the weld metal. The extent of the formation of this secondary phase may depend on the composition of the steel or filler material and the heat input during welding.

Q11. Write down the official parts of WPS or PQR Form.

1. Company Name
2. WPS NO.
3. Date
4. Made By
5. Welding procedure
6. Type of Welding
7. Clint name
8. DWG no.
9. Project name
10. Supporting PQR No.