Roll No												

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

TEST 1

Winter Semester: 2021 - 22
Course Code: PET 2027
Course Name: Petroleum Corrosion Technology
Program & Sem: B.Tech IV Semester

Date: 27th April 2022
Time: 03:00 pm to 04:00 pm
Max Marks: 30
Weightage: 15 %

Instructions:

(i) Read all the questions carefully and answer accordingly.
(ii) Question paper consists of three parts: Part A, Part B and Part C.
(iii) Attempting all the questions is mandatory.

Part A [Memory Recall Questions]

Answer all the Questions. Each question carries 2 marks. (5Q x 2M = 10M)

1. Gases dissolved in water such as _____, _____ and _____ can cause corrosion. (C.O.No.1) [Knowledge]

2. The corrosion rate of steel in oilfields decreases as_____ of water increases. (C.O.No.1) [Knowledge]

3. What is Cavitation and give an example of its occurrence in oilfields? (C.O.No.1) [Knowledge]

4. Pitting corrosion is a severe form of corrosion in oilfields. Give some details about this type of corrosion and what are the different type/shape of pits that develop from this corrosion. (C.O.No.1) [Knowledge]

5. What is Galvanic Corrosion and mention the two strategies/methods to prevent Galvanic corrosion in oilfields. (C.O.No.1) [Knowledge]

Part B [Thought Provoking Questions]

Answer the Question. The question carries 10 marks. (1Q x 10M = 10M)

6. You are a corrosion engineer in an ABC company, and you have been sent to give trainings to young graduates on the type of corrosions on a particular oilfield installation. The installation environment consists of dissolved gases in aqueous medium such as CO_2 and H_2S. Additionally, the installation also experiences different conditions including stresses, erosion and wearing of mechanical equipments, passivated alloys may be present and hydrogen induced failures may occur. You have to prepare a report on different types of corrosions that

can occur individually under such conditions, mention how do they occur and write the essential conditions for their occurrence? (C.O.No.1) [Comprehension]

Part C [Problem Solving Questions]

Answer both the Questions. Each question carries 5 marks. (2Q x 5M = 10M)

7. In the oilfield operations for corrosion protection, alloys are preferred over pure metals. Give an example and the possible reasons for it.

Heat Treatment is generally known to result in different microstructures and different mechanical properties. Give a brief account of the different heat treatment methods available and their influence on the steel characteristics. (C.O.No.1) [Comprehension]

8. Consider a case of high-velocity pipeline transportation of natural gas in the underground pipeline. The gas contains a particular amount of CO_2, H_2S and moisture. Additionally the pipeline is under stress and the soil on which it is landed contains moisture and sulfate reducing bacteria. Give your views on the possible internal and external corrosion in this pipeline and give brief idea about the possible methods to prevent these types of corrosion.

(C.O.No.1) [Comprehension]

Roll No												

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

TEST 2

Winter Semester: 2021 - 22
Course Code: PET 2027
Course Name: Petroleum Corrosion Technology
Program & Sem: B.Tech IV Semester

Date: 02/05/2022
Time: 3:00 PM - 4:00 PM
Max Marks: 30
Weightage: 15 %

Instructions:

(i) Read all the questions carefully and answer accordingly.
(ii) Question paper consists of three parts: Part A, Part B and Part C.
(iii) Attempting all the questions is mandatory.

Part A [Memory Recall Questions]

Answer all the Questions. Each question carries 3 marks. (4Q x 3 M = 12 M)

[CO. No. 2]

[Knowledge]

Q.No. 1. List all the stages of coating application. Detail them briefly. (C.O.No. 2) [Knowledge]

Q No. 2.Illustrate the general schematic of protective coating systems on a metal surface with clear markings. List atleast two functions of individual coats. (C.O.No. 2) [Knowledge]

Q No. 3. List the different tools used for coating inspection on oilfield installations? Explain briefly the working of these tools. (C.O.No. 2) [Knowledge]

Q No. 4. How does the air dried coating method differ from Force cured and Fusion bonded coating. Give examples for these coating methods. (C.O.No. 2) [Knowledge]

Part B [Thought Provoking Questions]

Answer the Questions. Each question carries 8 marks. (1Q x 8 M = 8M)

(C.O.No.2)

[Comprehension]

Q.NO. 5 You are a corrosion engineer in a XYZ company, and you have been sent to give trainings to young graduates on the type of corrosion on a particular oilfield installations. Your role is to inspect whether the applicator has followed the manufacturer's instructions for each specific coating material on the system. You must prepare a report advising the graduates about the potential coating application problems faced in coating process by the applicator. The report can include properties such as coating viscosity, coating thickness, curing time, temperature, thinner compatibility, time between coats, and others. (C.O.No.2) [Comprehension]

Part C [Problem Solving Questions]

Answer all the Questions. Each question carries 5 marks. (2Q x 5 M = 10 M)

[C.O. No. 2]

(Comprehension)

Q 6. Provide your understanding on how the coating process is completed in the following given oilfield installations. Detail the coating technique in any 3 out of 6 below given different installations.

(C.O. No. 2)

[Comprehension]

(1) Vessels,

(2) Tanks,

(3) Tubular goods,

(4) Flowlines, gathering systems, injection lines and piping,

(5) Offshore platforms,

(6) Pipeline Coatings

Q7. Give your insights on the purpose of coating system and illustrate the generalized scheme of coating system.

Explain the different layers of coats applied on metal surface. How does the different layers of coat contribute to preventing the corrosion on metal surfaces? [C.O. No. 2] (Comprehension)

Roll No												

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

TEST 2

Winter Semester: 2021 - 22
Course Code: PET 2027
Course Name: Petroleum Corrosion Technology (Open Elective-5)
Program & Sem: B.Tech (PET) IV Semester

Date: 02/06/2022
Time: 3:00 PM- 4:00 PM
Max Marks: 30
Weightage: 15 %

Instructions:

(i) Read all the questions carefully and answer accordingly.
(ii) Question paper consists of three parts: Part A, Part B and Part C.
(iii) Attempting all the questions is mandatory.

Part A [Memory Recall Questions]

Answer all the Questions. Each question carries Three marks. (4Q x 3 M = 12 M)

1. What is the significance of protective coatings in oil and gas facilities? Give an example of protective coating. List the desirable characteristics of coatings for long service? (C.O.No.2)
[Knowledge]

2.Classify the coatings based on different service environment prevalent in oilfields. Give applications for each type of service environment. (C.O.No. 2)
[Knowledge]

3. Classify coatings based on their dry film thickness. State the nature of forces acting on thick coatings leading to their disbonding/removal from the surfaces as compared to thinner coats. . (C.O.No. 2)
[Knowledge]

4. What do you understand by curing of coatings. Detail briefly any two curing methods? (C.O.No. 2)
[Knowledge]

Part B [Thought Provoking Questions]

Answer the Question. The question carries Eight marks. (1Q x 8 M = 8 M)

5 It is generally advised that the surface preparation should be done carefully before proceeding to other stages of corrosion prevention. Give your insights why it is advised so and

what will happen if proper care is not given to this stage, how it will impact the subsequent stages of protective coatings.

Anchor pattern is said to an important parameter of surface preparation. Detail its significance and its variation with different thickness of coatings? (C.O.No.2) [Comprehension]

Part C [Problem Solving Questions]

Answer all the Questions. The question carries Five marks. (2Q x 5M = 10 M)

6 You are a corrosion engineer in a XYZ company, and you have been sent for training industry personnel about the coating systems used in the petroleum industry

Give your insights on the generalized scheme of layers of coat forming a coating system through proper illustration. Detail their classification and respective functions of every coat type.

(C.O.No.2)

[Comprehension]

7. Inspection is an important part of the coating process. Provide you insights into at what stage the inspection should begin in the coating process for best performance coating applications? Provide reasons.

List the different tools used for coating inspection on oilfield installations. Explain briefly how do these tools work?.

(C.O.No.2)

[Comprehension]

Roll No												

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

END TERM EXAMINATION

Winter Semester: 2021 - 22
Course Code: PET 2027
Course Name: Petroleum Corrosion Technology
Program & Sem: B.Tech & IV Sem

Date: 1st July 2022
Time: 09:30 AM to 12:30 PM
Max Marks: 100
Weightage: 50%

Instructions:

(iv) Read all the questions carefully and answer accordingly.
(v) Question paper consists of three parts: Part A, Part B and Part C. Some questions contains multiple parts. Read carefully.
(iii) Attempting all the questions is mandatory

Part A [Memory Recall Questions]

Answer both the Questions. Each question carries 20 marks. (2QX 20M= 40M)

1. Choose the single best option among the multiple options for the questions (i-x).

(C.O No. 1) (Knowledge) (10Q x 2M = 20M)

i. H_2S can be generated by microorganisms which is known as

a) SRB b) Microbes
c) Virus d) None

ii. Sweet corrosion occurs due to the following chemical:

a) H_2S b) Carbonic acid
c) CO_2 d) None

iii. What is an Anode in a corrosion cell?

a) Surface of the metal that corrodes b) Surface of the metal that does not dissolve
c) Surface of the metal where reduction happens d) None

iv . Pitting is a type of

a) Localized Corrosion b) Uniform Corrosion
c) Protective Measurement d) All of the above

v. Cavitation is a phenomena which occurs

a) due to pressure changes in fluids b) due to formation and collapse of vapor bubbles

c) due to wearing away of metal from bubble collapse d) All of the above

vi. Hydrogen Induced Failures occurs due to

a) Trapping of hydrogen atoms into metal surface b) Hydrogen Embrittlement

c) Hydrogen Blistering d) All of the above

vii. Brittle Failures resulting in high strength steels when exposed to H_2S and moisture is known

a) Hydrogen Blistering b) Sulfide Stress cracking

c) Sweet Corrosion d) High Temperature Attack

viii. 18-8 stainless steel is an example of

a) Alloy b) Homogeneous alloy

c) Steel containing 18% chromium, 8% nickel, carbon and iron d) All of the Above

ix. Microbial Induced Corrosion is caused due to

a) Inactive Water Systems b) SRB

c) Formation of Bio-film by microbes d) All of the above

x. Intergranular Corrosion is preferential attack on

a) metal grain boundaries b) metal grains

c) whole metal body d) None of the above

2. Answer the following questions. Each question carries 5 marks. (4 Q X 5M = 20 M)

A. What is Cathodic Protection? Briefly explain through a proper illustration. **(C.O. No. 4) [Knowledge]**

B. What are the two approaches for Cathodic Protection based on different ways of supplying the necessary cathodic protection current. Explain Briefly? **(C.O. No. 4) [Knowledge]**

C. Explain the differences between the sacrificial anode and impressed current cathodic protection systems? **(C.O. No. 4) [Knowledge]**

D**.** List all the stages of coating application. Detail them briefly. **(C.O. No. 2) [Knowledge]**

Part B [Thought Provoking Questions]

Answer both the Questions. Each question carries 20 marks. (2Q x 15M = 30M)

3. Give your understanding of the Impressed current cathodic protection system. What is the role of impressed current anode. Give details of this method with a clear diagram considering impressed current system on a underground buried pipeline segment and proper marking of every component.

What precautions needs to be taken for effective working of this type of cathodic protection system.

(C.O. No. 4)

[Comprehension]

4. Suppose you are a corrosion engineer involved in selection of a specific inhibitor formulation for a specific program requires matching the inhibitor properties with the system's fluids, its environment, and application technique to provide optimum economical corrosion control, while at the same time avoiding introducing other operating problems. The need for different properties is the reason each oilfield chemical supplier has so many different formulations available.

As a corrosion engineer your role is to give your insights about the following given desirable properties and characteristics to be considered when selecting a corrosion inhibitor for a particular corrosive environment. **(C.O. No. 3)**

[Comprehension]

(1) Inhibits Corrosion

(2) Solubility/dispersability

(3) Foaming properties

(4) Compatibility with other chemicals

(5) Emulsification Properties

(6) Pour Point

(7) Free-Thaw Stability

(8) Thermal Stability

(9) Corrosiveness

(10) Mobility of individual components

Part C [Problem Solving Questions]

Answer both the Questions. Each question carries 20 marks. (2Q x 15M = 30M)

5. Identify the type of underground corrosion protection system shown below. Carefully write the names of all the components of the system shown in the Fig 1. marked as numbers from 1-11.

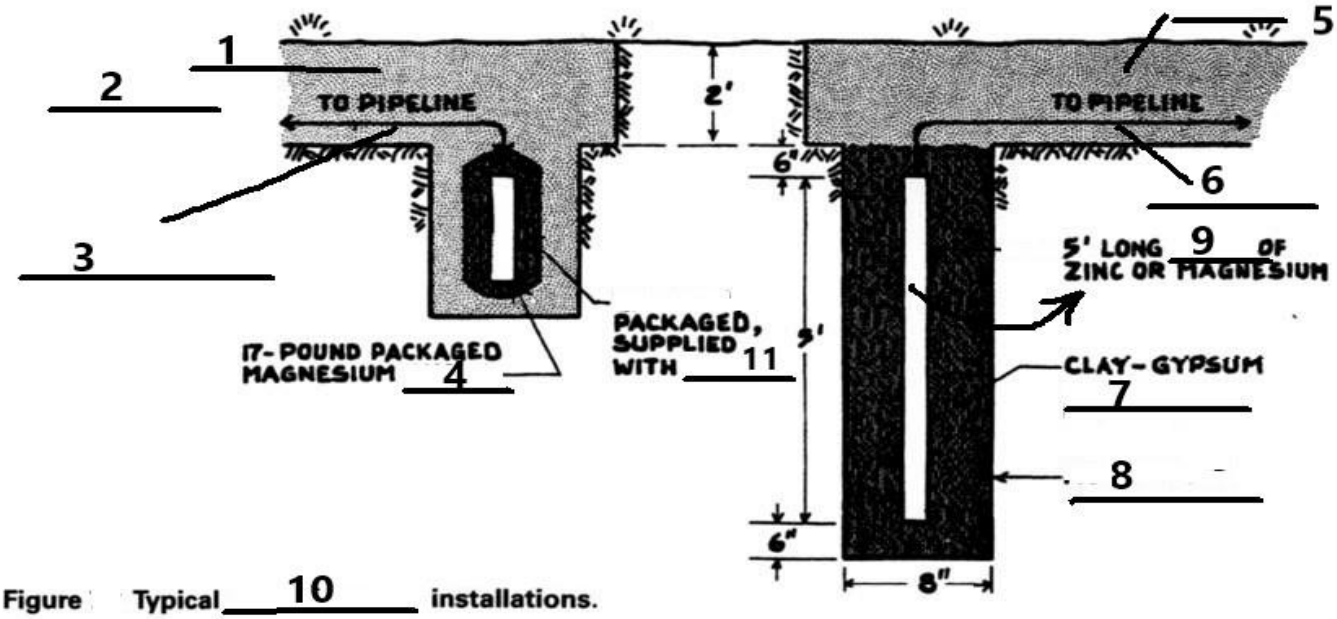

Figure Typical 10 installations.

Explain the working of this corrosion protection system and detail the three main working components of this protection system? **(C.O. No. 4)**
[Application]

6. Provide your understanding on how the coating process is completed in the following given oilfield installations. Detail the coating technique in any 3 out of 6 below given different installations.

(C.O. No. 2)

[Comprehension]

(1) Vessels,

(2) Tanks,

(3) Tubular goods,

(4) Flowlines, gathering systems, injection lines and piping,

(5) Offshore platforms,

(6) Pipeline Coatings