SEAT No._____

No of printed pages: 2

[1307]

**SARDAR PATEL UNIVERSITY**

**M.Sc. 4th Semester (Surface Coating Technology) (CBCS) Examination**

**Tuesday, 11h April, 2017**

**PS04CSCT01: Technology of Resins for Surface Coatings - II**

**Time: 02:00 pm to 5:00 pm** **Marks: 70**

N.B. 1) Marks allotted to the question are on its RHS

2) Illustrate your answer whereas necessary with the help of heat sketches and chemical equation

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**Q.1 Choose the correct Answer from the Followings:**

1. Which one of the following statements is true? [01]
   a) Film formation of Nitrocellulose lacquer occurs by solvent evaporation and Chemical Curing
   b) Film formation of Nitrocellulose lacquer occurs by solvent evaporation and Oxidative Polymerization
   c) Film formation of Nitrocellulose lacquer occurs by Solvent Evaporation
   d) Film formation of Nitrocellulose lacquer occurs by solvent evaporation and UR Radiation.
2. Which one of the following statements is true? [01]
   a) Dimer Fatty Acid based Non-Reactive Polyamide resin is use as a curing agent for epoxy resin.
   b) Saturated Acid based Reactive Polyamide resin is use as a curing agent for Polyester resin.
   c) Mineral Acid based Reactive Polyamide resin is use as a curing agent for epoxy resin.
   d) Dimer Fatty Acid based Reactive Polyamide resin is use as a curing agent for epoxy resin.
3. Which one of the following statements is not false? [01]
   a) Chlorinated rubber is a chemically inert material with poor film-forming properties. It is flammable, toxic and consists of white powder.
   b) Chlorinated rubber is a reactive material which is highly flammable, toxic and consists of white powder.
   c) Chlorinated rubber is a thermally stable material with excellent film-forming properties. It is non-flammable, nontoxic and consists of white powder.
   d) Chlorinated rubber is a chemically inert material with excellent film-forming properties. It is non-flammable, nontoxic and consists of white powder.
4. Which of the generic coating types listed below is recommended for service in sea water immersion? [01]
   a) Epoxy polyamide
   b) Epoxy ester
   c) Silicone alkyd
   d) Epoxy Melamine
5. Epoxy resins have _____ alkali resistance but _____ exterior durability. [01]
   a) Better, Poor
   b) Poor, Poor
   c) Better, Good
   d) Poor, Better
6. Solvents containing a labile hydrogen i.e _____ should be avoided in PU coatings. [01]
   a) Ketone
   b) Alcohols
   c) Aliphatic Hydrocarbon
   d) Aromatic Hydrocarbon
7. A _____ can be defined as an isocyanate reaction product which is stable at room temperature but dissociates to regenerate isocyanate functionality under the influence of heat. [01]
   a) Blocked Polyisocynate
   b) moisture cure urethane
   c) 2K urethane
   d) PUD's

8. The relative reaction rates of species with isocyanates are: [01]
1°amine > 2° amine > _____ > Water > Urea > Urethane > Carboxyl

a) Allophanate b) Ethers
c) Biuret d) Hydroxyl

**Q.2 Answer any Seven of the Followings:** [14]

a. Discuss about Nitrocellulose polymers used for NC lacquers.

b. Why and for what reasons DMP-30 is used and write its structure

c. Write the role and types of Reactive Diluent currently find use in Epoxy resin.

d. Bisphenol F based liquid epoxy resin have much lower viscosities for the same value of 'n' than their corresponding Bisphenol A resins?

e. Factors affecting pot life in Epoxy-Polyamide system.

f. Parameters which influence curing reaction condition of Blocked Isocynates

g. Explain the effect of NCO/OH ratio when it is < 1 and >1

h. Write the chemical reaction to prepare Urethane Oil.

i. Calculate Theoretical % NCO content for TDI, HDI and IPDI respectively

**Q.3 a.** Write a note on Epoxy resin not based on Bisphenol A. [06]

**b.** Describe the chemical reactions, method for preparation and formulation recipe for Reactive Polyamide resin based upon dimerised fatty acid and their uses. [06]

**OR**

**b.** Write reaction of Epoxy amine Adduct and also Formulate an epoxy-amine adduct (Aliphatic Adduct) having 40% solids and Amine value = 393 mg of KOH/gm by using Epoxy resin (EEW = 475 mg of KOH/gm, Solid = 75%) [06]

**Q.4 a.** Explain the formation of an Epoxide moiety from Epichlorohydrin and Bisphenol A. Explain the various grades of epoxy resins used in surface coating based on their molecular weight. [06]

**b.** Explain the three main chemical reaction, manufacture, properties and application of D4 type Epoxy ester resin in surface coatings. [06]

**OR**

**b.** Write a note on Epoxy Acid esters with no Acrylic Functionality. [06]

**Q.5 a.** What are Polyurethane resins? Give their classification as per ASTM standard based on their curing mechanism. Explain ASTM number 5 in detail. [06]

**b.** Write a note on one part Moisture Cured Urethane (MCU). [06]

**OR**

**b.** Write a note on Blocked Polyurethane. [06]

**Q.6 a.** List different types of diisocyanates and Polyisocyantes. For what reason diisocynates are transformed into Polyisocyantes. [06]

**b.** Write a note on Silicone based PUD's. [06]

**OR**

**b.** What are the Specification, Characteristics and Analytical methods used to test the quality of Isocyantes? [06]

SEAT No._____

[100]

No of printed pages: 2

**SARDAR PATEL UNIVERSITY**

**M.Sc. 4th Semester (Surface Coating Technology) (CBCS) Examination**

**Monday, 17th April, 2017**

**PS04CSCT03: Coatings Application & Speciality Coatings**

**Time: 2:00 pm to 5:00 pm** **Marks: 70**

N.B. 1) Marks allotted to the question are on its RHS

2) Illustrate your answer whereas necessary with the help of heat sketches and chemical equation

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**Q.1 Choose the correct Answer from the Followings:**

1. In conversion coatings, at final rinsing, pH of the bath is generally **[01]**

   a) 0.5-1.0 b) 2.5-4

   c) 7 – 9.5 d) 9.5-11

2. In conversion coating iron phosphate is also known as **[01]**

   a) Alkali metal phosphating b) Acid metal phosphating

   c) Chromium Phosphating d) Hydrated metal phosphating

3. To attain improved adhesion on plastics, treatment of the substrate to _____its surface tension. So that wetting is possible with coating. **[01]**

   a) Decreases b) Remove

   c) Increases d) None of these

4. In conventional spray gun, the air valve must open _____the needle valve open. **[01]**

   a) Simultaneously b) After

   c) Before d) None of these

5. Corrosion Technology & Heavy Duty Protective Coatings **[01]**

   a) Elecrodo position b) Roller

   c) Spray gun d) Brush

6. High electronegetavity of floride provide in fluoro polymer **[01]**

   a) Good wetting properties b) Good Exterior durability

   c) Good Flexibility properties d) Good Optical properties

7. Concentration of Zinc Phosphating solution is _____% as a water solution in Zinc Phosphate treatment. **[01]**

   a) 10-15% b) 15-20%

   c) 1-5% d) 20-25%

8. Widely used solvent for solvent degreasing is **[01]**

   a) Dichloroethylene b) Trichloroethylene

   c) Phosphoric acid d) Chromium Phosphate

**Q.2 Answer <u>any Seven</u> of the Followings:** **[14]**

a. How curtain coating can be applied on metal substrate?

b. Write about four electrolytic process take place in anodic electro coatings.

c. Give flow chart diagram on chromate treatment on aluminium & Zinc phosphate for steel substrate.

d. Write about testing of conversion coatings.

e. Explain the sacrificial effect in Zinc and chrome base primer?

f. What is the role of the back coat in Coil coating application?

g. Explain Solvent Degreasing as metal pre-treatment.

h. What is VOC? Write the advantage and disadvantage of powder coating.

i. Write advantages and disadvantages of the coil coating application.

**Q.3 a.** What is the principle involved in conventional spray application? Explain in details conventional spray application with main parts of it. **[06]**

**b.** What is dip application? Explain with diagram. Give brief account of vacuum impregnation and flow coating. What are the requirements of paint for dipping? **[06]**

**OR**

**b.** Write about hot spray application. What are advantages of hot spray application? Draw movement of robot painter with diagram. Give details of airless spraying with Its advantages. **[06]**

**Q.4 a.** What is a conversion coating? Write in details about zinc phosphating, iron phosphating Chromium phosphating for various metals with coating mechanism reaction. **[06]**

**b.** Write in detail about covalent bonding to Glass by giving suitable example of silanol Group. Write about adhesion on plastics **[06]**

**OR**

**b.** Why metal cleaning require? Explain Metal surface pre-treatment, solvent Degreasing and various aqueous cleaning. **[06]**

**Q.5 a.** Write a note on Fluoro Polymer which is used in Different coating department. **[06]**

**b.** Describe hyperbranched polymers in coating. **[06]**

**OR**

**b.** Describe the polyurethane Dispersion. **[06]**

**Q.6 a.** Distinguish between polyurea and polyurethane and explain the application of polyurea. **[06]**

**b.** Describe the Self-healing Coating. **[06]**

**OR**

**b.** What are the advantages and disadvantages of the coil coating and what is the application and which binder system are used in coil coating application. **[06]**

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SEAT No._____ No of printed pages: 2

[1273]

SARDAR PATEL UNIVERSITY

M.Sc. 4th Semester (Surface Coating Technology) (CBCS) Examination

Thursday, 13th April, 2017

PS04CSCT07: Corrosion Technology & Heavy Duty Protective Coatings

Time: 2:00 pm to 5:00 pm Marks: 70

N.B. 1) Marks allotted to the question are on its RHS

2) Illustrate your answer whereas necessary with the help of heat sketches and chemical equation

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**Q.1 Choose the correct Answer from the Followings:**

1. _____ are not affecting the rate of corrosion. [01]

   a) Oxygen b) Chemical Salt

   c) Temperature d) Time of use

2. Which glass flakes have a low average thickness? [01]

   a) C – type glass flakes b) E – type glass flakes

   c) ECR – type glass flakes d) LA – type glass flakes

3. Which of the following pairs of metal would show the highest rate of corrosion in seawater? [01]

   a) Copper and Steel b) Copper and Zinc

   c) Copper and Brass d) Copper and aluminum

4. When Pt and Co are electrically connected, which one gets corroded firstly? [01]

   a) Pt b) Co

   c) None d) Both a and b

5. Difficult to monitor and very dangerous form of corrosion is _____. [01]

   a) Galvanic b) Pitting

   c) Crevice d) Stress

6. Which of following metals could provide cathodic protection to Fe? [01]

   a) Al & Cu b) Al & Zn

   c) Zn & Cu d) Al & Ni

7. As compare to iron, aluminium has _____. [01]

   a) Higher tendency to oxidize b) Equal tendency to oxidize

   c) Less tendency to oxidize d) None of above

8. Corrosion of metals involves _____. [01]

   a) Physical reactions b) Both

   c) Chemical reactions d) None

Q.2 Answer Any Seven of the Followings: [14]

1. What is Galvanic Series?
2. Explain the effect of oxygen on the rate of corrosion.
3. Give the classification of different corrosive atmosphere.
4. How corrosion inhibitors work to protect the metal?
5. Explain in brief cathodic protection?
6. List the different direct and indirect losses of the corrosion.
7. Define corrosion and passivation.
8. What is the Effect of Pollutant on Corrosion rate?
9. Draw the different Pitting types according to ASTM.

Q.3 (a) Describe the different corrosion cell. [06]

(b) Explain briefly Pitting Corrosion. [06]

OR

(b) Write a short note on Glass flake Epoxy Coating. [06]

Q.4 (a) Describe the factors that affect rate of corrosion and give the classification of corrosion. [06]

(b) Give the importance of the pipeline coating. [06]

OR

(b) Give the detail about losses of the corrosion. [06]

Q.5 (a) Write a note on Uniform corrosion. [06]

(b) Explain in brief Galvanic corrosion. [06]

OR

(b) Describe Crevice Corrosion. [06]

Q.6 (a) Write a note on Fatigue Corrosion. [06]

(b) Explain Microbiological Induced Corrosion (MIC) in detail. [06]

OR

(b) Explain different methods to Control Corrosion. [06]

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SEAT No._____ No of printed pages: 2

[68]

**SARDAR PATEL UNIVERSITY**

**M.Sc 4th Semester (Surface Coating Technology) (CBCS) Examination**

**Wednesday, 19th April, 2017**

**PS04ESCT02: Environmental Management**

**Time: 2:00 pm to 5:00 pm** **Marks: 70**

N.B. 1) Marks allotted to the question are on its RHS

2) Illustrate your answer whereas necessary with the help of heat sketches and chemical equation

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**Q.1 Choose the correct Answer from the Followings:**

**1.** Which of the following is NOT the principle of green chemistry? **[01]**

a) Maximizing atom economy
b) Increasing by-products
c) Designing degradable chemical products
d) Using catalysts

**2.** In the case were carbon dioxide is used as a carbon-source building block, if the $CO_2$ were made from burning fossil fuels it would be considered as _____. **[01]**

a) depleting
b) renewable
c) both a & b
d) none of these

**3.** Which of the following statements concerning atom economy are correct? **[01]**

a) It indicates how well a reaction converts the reactant atoms to the desired product.
b) It indicates how fast reaction takes place.
c) It indicates how much by-product gets in reaction.
d) None of the above.

**4.** The presence of which of the following gases in air checks the UV light from sunlight? **[01]**

a) $SO_2$
b) $CO_2$
c) NO
d) $O_3$

**5.** Photochemical smog is related to pollution of _____. **[01]**

a) air
b) water
c) soil
d) none of these

**6.** BOD/COD ratio always be; _____. **[01]**

a) Equal to 1
b) more than 1
c) less than 1
d) none of these

**7.** In which process decomposition of organic waste is done by exposing it to high temperature in absence of oxygen? **[01]**

a) Incineration
b) Pyrolysis
c) Gasification
d) none of these

**8.** Environmental pollution refers to _____. **[01]**

a) Peeling of top soil
b) Dissipation of energy
c) Release of toxic/undesirable material in environment
d) None of these

**Q.2 Answer any seven of the Followings:** **[14]**

1. Define Green Chemistry. Write its benefits.
2. Enlist chemical reaction and identify which one is more atom economical and why?
3. What is a renewable and depleting feedstock? Give its example.
4. What is supercritical fluid? Write advantages of using it as a solvent.
5. Explain why 'Waste reuse and recycling are the preferred options' when managing solid waste.
6. Enlist drivers of EMS.
7. Define EMS according to ISO 14001 standards.
8. Define air pollution and enlist major air pollutants.
9. List the various air pollution control methods.

**Q.3** **(a)** Why should chemists pursue the goals of green chemistry? Explain in detail. **[06]**

**(b)** Write a note on Green Solvent. **[06]**

**OR**

**(b)** "Energy requirements should be recognized for their environmental and economic impacts and should be minimized". Explain. **[06]**

**Q.4** **(a)** Write a note on 'Evaluating feedstock and starting materials' with respect to green chemistry concept. **[06]**

**(b)** Explain in detail real-time, in-process analysis beneficial to green chemistry. **[06]**

**OR**

**(b)** Describe in detail about the tools of green chemistry **[06]**

**Q.5** **(a)** What are BOD and COD? How it is determined? **[06]**

**(b)** Write a note on solid waste management methods to reduce waste. **[06]**

**OR**

**(b)** Write a note on Acid rain. **[06]**

**Q.6** **(a)** Write benefits of ISO 14001 certification. **[06]**

**(b)** Explain in brief tools of EMS **[06]**

**OR**

**(b)** Explain in detail about waste minimization methods for paint manufacturing industries. **[06]**

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