Seat No. _____ Enrolment No. _____

THE CHARUTAR VIDYA MANDAL UNIVERSITY

Master of Science (Surface Coating Technology) - SEMESTER 2
April 2023 (Regular) EXAMINATION

Course Title: Technology of Resins for Surface Coatings- 1
Course Code: 201470201
Total Printed Pages : 02
Date: 17/04/2023 Time: 10:00 am to 12:00 noon Maximum Marks: 50

Instructions:
- Attempt all questions.
- Numbers to the right indicate full marks for each question.
- Make suitable assumptions wherever necessary.

Q.1 Answer the following multiple choice questions. (04)

1 _____ is the major fatty acid in Castor Oil.
(a) Ricinoleic Acid (b) Steric Acid (c) Luaric Acid (d) Eleosteric Acid

2 _____ is generally cured with amino-formaldehyde resin to prepare Stoving enamel.
(a) Short oil alkyd (b) Rosin Modified Maleic (c) Ester Gum (d) None

3 Phenolic grade of Novalac can be synthesized by taking f/p ratio _____.
a) >1 b) <1 c) =1 d) None

4 _____ monomer gives Exterior Durability, Hardness, Stain and Water resistance film properties
(a) Styrene (b) Vinyl Acetate (c) Butyl Acrylate (d) Methyl Methacrylate.

Q.2 Answer in brief and to the Point (3 questions of 2 marks each) (06)

1 What is Iodine Value? How it is measured?

2 Write the Direct esterification, Alcoholysis reaction, Acidolysis reaction, Half ester reaction involve in synthesis of polyester resins.

3 List out difference between Thermoplastic and Thermosetting acrylic resins.

Q.3 a Write the manufacturing and mechanism of Dehydrated Castor Oil (DCO) along with its properties and uses. (05)

b Differentiate between Alkyd resin Vs. Unsaturated Polyester Vs. Saturated Polyester used in surface coatings. (05)

OR

b Formulate an alkyd resin with 62.5 % oil length (Soyabean Oil) with (05)

Pentaerythritol as polyol with 5% excess OH group over polyol and also calculate R, K , P, F_{avg}, Water of Reaction, Oil length, % Yield, Initial Acid value and Hydroxyl value for the same.

Q.4 a Write the structures of the following: (05)
(a) Neopentyl Glycol (b) Trimethylol Propane (c) Glycerol
(d) Butyl ethyl propanediol (e) Cyclohexanedimethanol

b Give the causes and **remedies for the following *any Two* in Polyester cook** **(05)**
(a) Glycol Losses (b) Foaming (c) Gelation

OR

b Calculate R, K, $P_{gel\ pt.}$, F_{avg}, % Yield, Initial Acid Value and Hydroxyl Value in finished Unsatutrated Polyester resin. (05)

Sr. No.	Ingredients	Mol. Wt.	Weight (in Gms)	
1	Neopentyl Glycol	104	2830	**All Calculations to be done on Total = 6693 weight basis.**
2	Adipic Acid	146	650	
3	Isopthalic Acid	166	2300	
4	Terpthalic Acid	166	913	
	Total		6693	

Q.5 a Write a brief note on Drip Feed Solution Polymerization Process for acrylic monomers. (05)

b List four available copolymer types of Vinyl resins and discuss any one of them in details. (05)

OR

b Write the chemical formulae for the following monomers: (05)
(a) Acrylamide (b) Glycidyl Acrylate (c) Butyl Methacrylate
(d) Hydroxy Ethyl Methacrylate (e) 2-Ethyl Hexyl Methacrylate

Q.6 a Write the advantage and disadvantage of Rosin. List the modified Rosin. (05)

b Describe synthesis mechanism of resoles and novalacs. **(05)**

OR

b Describe different raw materials used in synthesis of amino resins and their significance. How choice of solvents affect properties of amino resin. (05)

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Seat No. _____ Enrolment No. _____

THE CHARUTAR VIDYA MANDAL UNIVERSITY

Master of Science (Surface Coating Technology) - SEMESTER 2

April 2023 (Regular) EXAMINATION

Course Title: Chemistry & Technology Of Organic Pigments, High Performance Pigments, Additives & Solvents
Course Code: 201470202
Total Printed Pages : 02
Date: 19/04/2023 Time: 10:00 am to 12:00 noon Maximum Marks: 50

Instructions:

- Attempt all questions.
- Numbers to the right indicate full marks for each question.
- Make suitable assumptions wherever necessary.

Q. 1 Answer the following multiple choice questions. (04)

1 Which of the following is not a gloss defect?

(a) Bloom (b) Haze (c) Cissing (d) Blush

2 Craters in a paint surface can occur due to

(a) Poor Dispersion (b) Auxiliary Drier (c) Over spray (d) High viscosity

3 Which solvents have most poor hydrogen bonding?

(a) Ketones (b) Esters (c) Alcohols (d) Hydrocarbons

4 In the history of drier technology, Driers were prepare with _____ other than octoates

(a) Vanadates (b) Oxides (c) Naphthanates (d) Urethanes

Q.2 Answer in brief and to the Point (3 questions of 2 marks each) (06)

1 What is Aniline point? Give rages of aniline Point.

2 **Solution A** is 600 gms resin solution of 60% solid. **Solution B** is 500 gms resin solution of 35% solid. If we add solution B into Solution A, what would be **% solid of new mixture** (600 gms A + 500 gms B)?

3 What is primary reason for most organic pigment considered transparent?

Q.3 a Write in details of Pthalocynine Pigment. (05)

b What is Foam? Explain Nature of Foam .How Foam is stabilized? What are the basic requirements of Defoamer? (05)

OR

b What are driers? Why they are used? Give their mechanism in oxidative cured systems. Explain role of active drier and auxiliary drier with two examples in each class. (05)

Q.4 a What are Solvents? Explain theory of solvency giving suitable formula. Explain Solvent balance. (05)

b Give classification of AZO Pigments. Write a note on Acrylamide Yellow (05)

OR

b Write note on <u>any two</u> (05)

(1) Beta napthol red & Azo bona toners

(2) Quinacridone Pigment

(3) Isoindolinone and isoindoline Pigment

Q.5 a Write all three manufacture process of drier in details. (05)

b Why Wetting & Dispersion is important in pigmented coatings? Explain in Brief characteristics of W&D agent used in coatings. What is controlled Flocculation? (05)

OR

b Chemistry of silicon additive as 'surface additive'. (05)

Q.6 a What are important properties of 'Plasticizers', Give its classifications. (05)

b Give the brief account of Metal Complex and Fluorescent dyestuff pigments (05)

OR

b Explain in Detail (05)

(1) Which are most common problems of α-Blue related to reducing tinting strength?

(2) What is chemisorption of drier onto the pigment surface?

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Seat No. _____ Enrolment No. _____

THE CHARUTAR VIDYA MANDAL UNIVERSITY

Master of Science (Surface Coating Technology) - SEMESTER 2

April 2023 (Regular) EXAMINATION

Course Title: COATING PROPERTIES & ANALYSIS OF COATING

Course Code: 201470203

Total Printed Pages : 02

Date: 21/04/2023 **Time: 10:00 am to 12:00 noon** **Maximum Marks: 50**

Instructions:

- Attempt all questions.
- Numbers to the right indicate full marks for each question.
- Make suitable assumptions wherever necessary.

Q. 1 Answer the following multiple choice questions. **(04)**

1 Which of the following is/are test performed during application of paint?

a) WFT b) Drying Time c) Both a & b d) None

2 A pull-off adhesion test is done to measure the resistance of a coating to separate from a substrate applying a perpendicular _____.

(a) Tensile force (b) Torsional force

(c) Gravitational forces (d) None of these.

3 Stormer paddle viscometer gives viscosity in _____ unit.

a) Pascal's b) Kreb c) Stokes d) Poise

4 What information can be obtained from accelerated UV exposure

(a) Gloss and Color Change (b) Chalking resistance

(d) Corrosion Resistance (d) a & b

Q.2 Answer in brief and to the Point (3 questions of 2 marks each) **(06)**

1 How fineness of grind is measured by Hegmann gauge?

2 Calculate the kinematic viscosity of Alkyd Resin (50% in Xylene, Specific Gravity = 1.03, Poise=15) at 20°C in centistokes.

3 Classify the different 'Gloss Values' according to PVC

Q.3 a Define Viscosity and Derive the unit in poise? **(05)**

b Classify the Viscometer on accuracy of measurement and suitability for flow system. Discuss in detail about Falling Sphere Viscometer. **(05)**

OR

b Write a note on Stromer Viscometer. **(05)**

Q.4 a Define VOC. Explain how it is determined. (05)

b Give the importance of % Volume Solids and describe the three categories of Coatings based on %VS, explain in detail. (05)

OR

b Write the flow chart for determination of film thickness (05)

Q.5 a Write a note on Practical Coverage Calculations. (05)

b List the measurement methods for adhesion of coatings. Discuss any one. (05)

OR

b Write about mechanical theory of adhesion of coating to the substrate. (05)

Q.6 a What are the different hardness tests? Explain the Koing-Persoz instrument? (05)

b Discuss about the defect blistering its appearance, causes and remedies. (05)

OR

b Discuss about the defect Runs and sags its appearance, causes and remedies. (05)

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Seat No. _____ Enrollment No. _____

THE CHARUTAR VIDYA MANDAL UNIVERSITY

M.Sc. SURFACE COATING TECHNOLOGY – SEMESTER 2

APRIL 2023 (REGULAR) EXAMINATION

Course Title: Chemical Engineering Operation

Course Code: 201470207

Total Printed Pages: 02

Date: 25/04/2023 **Time: 10.00 am to 12.00 pm** **Maximum Marks: 50**

Instructions:

- Attempt all questions.
- Numbers to the right indicate full marks for each question.
- Make suitable assumptions wherever necessary.

Q. 1 Answer the following multiple-choice questions. **(04)**

(I) The conversion of kinetic energy into pressure energy is more efficient with ____ type of casing.
a) volute b) diffuser c) vortex d) none of these

(II) The crushers operate by ____.
a) impact b) compression c) attrition d) cutting

(III) The separation of liquid mixture is possible for relative volatility values ___.
a) greater than 1 b) less than 1 c) equal to 1 d) none of these

(IV) The materials which have low thermal conductivity are called as ____.
a) thermal conductors b) thermal resistors
c) thermal insulators d) none of the above

Q.2 Answer in brief and to the Point (3 questions of 2 marks each) **(06)**

(I) What is cavitation in Centrifugal pump?

(II) State Raoult's law and Dalton's law.

(III) What do you mean by Axial flow impeller and Radial flow impeller?

Q.3 (a) Discuss in detail about centrifugal pump. **(05)**

(b) Write a note on positive displacement pump. **(05)**

OR

(b) Distinguish between centrifugal pump and positive displacement pump in detail. **(05)**

Q.4 (a) Discuss the factors to be consider for selecting grinding media **(05)**

(b) Define filtration and explain in detail rotary drum vacuum filter. **(05)**

OR

(b) Write a note on construction and working of ball mill. **(05)**

Q.5 (a) What is drying? Explain typical rate of drying curve under constant drying condition. **(05)**

(b) What are Azeotropes? Explain azeotropic distillation process & its importance in coating industry. **(05)**

OR

(b) State the reasons for carrying drying operation industrially and discuss the factors on which the rate of drying depends. **(05)**

Q.6 (a) Derive the equation for heat flow through one plane wall of uniform thickness by conduction. **(05)**

(b) Derive an expression for heat flow through a thick-walled cylinder by conduction. Take r_1 and r_2 as the inner and outer radii of cylinder, k as a mean thermal conductivity. Assume T_1 as the inside temperature and T_2 as the outside temperature. **(05)**

OR

(b) Calculate the rate of heat loss Q, through a wall of red brick [k = 0.70 W / (m. K)] 5 m in length, 4 m in height and 250 mm in thickness, if the wall surface is maintained at 373 K and 303 K respectively. **(05)**

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