

THE CHARUTAR VIDYA MANDAL UNIVERSITY**M.Sc. (Surface Coating Technology) – SEMESTER 3****November 2021 EXAMINATION****Course Title: TECHNOLOGY OF RESINS FOR SURFACE COATINGS-II****Course Code: 101470301****Total Printed Pages : 2****Date: 16/11/2021****Time: 01.30 pm to 03.30 pm****Maximum Marks: 60****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.** **(12)**
- (1) Which of the following should not be used as solvent in PU?
a) Aromatic hydrocarbon b) MEK c) Aliphatic hydrocarbon d) Alcohol
 - (2) Identify the correct relative reactivity rate of polyol with isocyanate.
a) $1^\circ > 2^\circ > 3^\circ$ b) $1^\circ > 3^\circ > 2^\circ$ c) $3^\circ > 2^\circ > 1^\circ$ d) $2^\circ > 1^\circ > 3^\circ$
 - (3) Isocyanates react with mine to give _____
(a) Polyurea (b) Amide (c) Biuret (d) Urethane
 - (4) Which of following polyol has high acid and alkali resistance?
a) Polyester b) Alkyd c) Acrylic d) All
 - (5) Anionic PUD's can be obtained when _____ is pendant group.
a) $-\text{COOH}$ b) SO_3H c) $-\text{NH}_2$ d) both a & b
 - (6) Which of the following resin is synthesized by Taffy process?
a) DGEBA b) High molecular weight epoxy c) Phenoxy d) None
 - (7) Drying rate of _____ is dependent of relative humidity.
a) MCU b) Blocked PU c) PUD's d) None
 - (8) Epoxy resins with EEW of 700-1000 are used in synthesis of _____.
a) Coil coating b) Epoxy ester c) Stoving finish d) None
 - (9) Polyamide used in coating is generally prepared by reaction of amine with _____.
a) Dimer fatty acid b) Anhydride c) Monoacids d) Esters
 - (10) Epoxy ester are prepared by reaction of epoxy with _____.
a) Ester b) Fatty acid c) Oil d) None
 - (11) Me:Ph ratios in commercial silicone resin are found as _____.
a) 0.25-0.5:1 b) 1:1 c) 2:1 d) 3:1
 - (12) Which of the following properties get improved when alkyd is reacted with silicone resin?
a) Colour retention b) Heat resistance c) Water resistance d) All

- Q.2** Attempt any eight of the following. (16)
- (1) Calculate theoretical % NCO for MDI and HDI.
 - (2) If the % NCO of polyisocyanate is 21% calculate NCO equivalent weight.
 - (3) What are the properties expected using aromatic vs aliphatic hardeners in PU.
 - (4) Describe the reaction of R-NCO with a) Amine b) H₂O
 - (5) Define pot life.
 - (6) List out parameters to reduce viscosity of epoxy resin.
 - (7) Highlight difference in synthesis of epoxy acrylic and epoxy ester.
 - (8) Classify Epoxy ester on the basis of oil length.
 - (9) Describe direct method for synthesis of chlorosilanes.
 - (10) Describe uses of silicones in surface coatings.
- Q.3** Describe in detail Taffy and Advancement process for synthesis of (08)
OR
- Q.3** Formulate epoxy ester D-4 type with epoxy resin having EEW = 830, Hydroxyl group content = 3200. (08)
- Q.4** Write a note on Blocked Isocyanate used in Polyurethane (08)
OR
- Q.4** Describe in detail about PUD's. (08)
- Q.5** Write a note on Chlorinated rubber used in paint industry. (08)
OR
- Q.5** Describe properties of silicone resins used in surface coatings. (08)
- Q.6** Write a note on Nitrocellulose resin used in paint industry. (08)
OR
- Q.6** Classify in details curing agents for epoxy. (08)

THE CHARUTAR VIDYA MANDAL UNIVERSITY
Master of Science (Surface Coating Technology) – SEMESTER 3
November 2021 EXAMINATION

Course Title: Technology of Paint Manufacturing

Course Code: 101470302

Total Printed Pages : 02

Date: 17/11/2021

Time: 1:30 pm to 3:30 pm

Maximum Marks: 60

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. **(12)**

- (1) Diameter of container (Vessel) should be _____ of disc diameter in HSDD
(a) 2.8-4 D (b) 0.2-0.4 D (c) 1.8-2.0 D (d) 0.8-1.8 D
- (2) As shear rate increased in HSDD which flow pattern develop?
(a) Laminar (b) Smear (c) Smash (d) Turbulent
- (3) In Ball Mill Ceramic balls ware loss may range from _____ % w / 100 hr
0.03-0.05 (b) 0.3-0.5 (c) 3.0-7.0 (d) 0.003 to 0.007
- (4) Loading lower than _____ % of the ball mill volume introduce a slippage and excessive wear of ball mill surface.
(a) 10 (b) 20 (c) 30 (d) 40
- (5) In latex paint LCPVC _____ as the particle size of latex decreases.
(a) Decrease (b) Increases (c) Remain Same (d) Doubles
- (6) Charging the ball mill to _____ mark with balls gives the most efficient dispersion.
(a) 1/2 (b) 1/3 (c) 1/4 (d) 3/4
- (7) Following is not a part of TSD
(a) Rotor (b) Central Shaft (c) Disc (d) Screen
- (8) In same direction rotations of roller in TRM are
(a) Feed, Apron (b) Feed, Centre (c) Apron, Centre (d) all three
- (9) Critical Reynold Number associate with which paint machinery?
(a) HSDD (b) TRM (c) Ball Mill (d) TSD
- (10) What will happen if there is a solvent shock observed?
(a) Resin adsorbed on pig surface (b) Solvent adsorbed on surface
(c) Dispersion improves (d) Flocculation decreases
- (11) CPVC are independent of _____.
(a) OA (b) Binder type (c) Density of Pigment (d) Pigment Condition
- (12) Which is not tested for waterborne coatings
(a) Freeze Thaw Stability (b) Weight Per Liter (c) Skinning (d) Viscosity

Q.2 Attempt **Any Eight** of the following. **(16)**

- (1) Write down mud cracking of latex paint film.
- (2) What are Factors affecting Film Formation of water based coatings.
- (3) How temperatures build up during processing affect dispersion in HSDD?
- (4) Give equations of P (horsepower) requirement for a sandmill of size S.

- (5) In HSDD what denote 'D' with reference to impeller?
 (6) What is "Binder Index"?
 (7) Give three different position for ball media in conventional ball mill.
 (8) What is screen blinding in bead mill?
 (9) What is difference between Flocculation & Agglomeration?
 (10) What is "Solvent Shock"? How it results in to flocculation?
- Q. 3** (a) Explain in detail with figure smearing versus smashing dispersion. (04)
 (b) Discuss Ball size density and shape in Ball mill. Give details about ceramic balls, Metallic Balls uses in Ball mill. (04)

OR

- Q. 3** (a) Explain Mill base rheology in HSDD with diagram. Discuss size, positioning and speed of Disperse blade. (04)
 (b) Advantages and Disadvantages of Bead Mill and Ball Mill (04)
- Q. 4** Draw schematic diagram of conventional TRM. Explain its working in detail. Give its material balance equations. (08)

OR

- Q. 4** (a) Calculate the production rate Q_m for 15 x 40 inch three roll mill if the feed nip clearance is Maintained at 6.0 mills. The mill rolls are geared for the following revolution per minute; Feed roll 45 rpm, center roll 135, apron roll 405 rpm. ((Q_m (gal/hr) = 4.7×10^{-4} D L x rpm(1+n) ca)) (04)
 (b) How good, fair, and poor dispersion can be achieved by WET point and FLOW point. (04)
- Q. 5** (a) What is charge repulsion and Entropic repulsion? Which one is more important in Aqueous dispersion? Explain in details with effect of layers adsorbed. (04)
 (b) Explain in detail how film properties 'adhesion' , 'Tensile strength' , 'stain resistance' and 'Hiding' changes as PVC reaches to CPVC and above CPVC with graph. (04)

OR

- Q. 5** (a) Calculate CPVC of given ingredients of Paints. (04)
- | | | |
|-------------------------|------------|--------------------------|
| 1. Zinc Oxide | weight 20% | Sp. Gravity 5.40, O.A 18 |
| 2. Iron Oxide synthetic | weight 35% | Sp. Gravity 4.70, O.A 23 |
| 3. Talcum | weight 42% | Sp. Gravity 2.60, O.A 33 |
| 4. Clear Varnish | weight 20% | Sp. Gravity 0.92, O.A 00 |
- (b) Explain in depth dispersion in organic media with wetting, separation and stabilization. (04)
- Q. 6** Discuss importance of plant location & factors should be considered in choosing plant Site. (08)

OR

- Q. 6** (a) Discuss different factors regards to 'Plant Lay out'. (04)
 (b) Discuss health and safety regulations in details with different abetment. (04)

Seat No. _____

Enrolment No. _____

THE CHARUTAR VIDYA MANDAL UNIVERSITY
Master of Science (Surface Coating Technology) – SEMESTER 3
November 2021 EXAMINATION

Course Title: Technology of Architectural Coating and Industrial Coatings

Course Code: 101470303

Total Printed Pages : 02

Date: 18/11/2021

Time: 1:30 pm to 3:30 pm

Maximum Marks: 60

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. **(12)**

- (1) %PVC =
(a) = (Volume of Binder) / (Volume of Pigments + Volume of Binder) x 100
(b) = (Volume of Pigments) / (Volume of Pigments + Volume of Binder) x 100
(c) = (Volume of Binder) / (Volume of Pigments + 2 *Volume of Binder) x 100
(d) = (Volume of Pigments) / (Volume of Pigments + 2 *Volume of Binder) x 100
- (2) _____ grade of cellulose nitrate contains 11.3 to 11.8 content of % nitrogen having 2.06 to 2.20 number of ester groups per structure unit?
(a) M (b) A (c) E (d) P
- (3) The corrosion protection action of zinc rich epoxy ester primer is based on
(a) Electrochemical Protection (b) Sealing Action
(c) Chemical Protection (d) All of these
- (4) During emulsification of epoxy resins, at the phase inversion point, the _____ is maximum and at this point the _____ of aqueous epoxy emulsion can be influenced by varying the shear force and shear time.
(a) Viscosity, Particle size (b) Particle size, Viscosity
(c) Shear Rate, Viscosity (d) Viscosity, Shear Rate
- (5) The _____ and _____ are not conducive to use of water as a paint solvent.
(a) High Surface Tension, High Evaporation Number
(b) Low Surface Tension, Low Evaporation Number
(c) Low Surface Tension, High Evaporation Number
(d) High Surface Tension, Low Evaporation Number
- (6) The Commercial available product Texanol (2, 2, 4 trimethyl 1, 3 pentandiol-1-isobutyrate) is used as _____ in latex paints.
(a) Rheology Modifier (b) Coalescing Agent
(c) Co-Solvent (d) Preservatives
- (7) A variety of abrasive materials glued to paper backing sheets are used to smooth wood and hardened surface finishes, _____ abrasives are known collectively as sandpaper.
(a) Aluminium oxide (b) Silicone Carbide
(c) Self Lubricating Silicone carbide (d) All of these
- (8) 2K Polyurethane automotive coating based on _____ & _____ system gives excellent gloss and exterior durability; It retains colour and gloss for a long time and possesses resistance to weather, gasoline, petroleum & oil.
(a) Epoxy Polyol & Aliphatic Isocyanates
(b) Epoxy Polyol & Aromatic Isocyanates
(c) Acrylic Polyol & Aliphatic Isocyanates
(d) Acrylic Polyol & Aromatic Isocyanates

- (9) Hot melt thermoplastic road marking compound content aggregates which make marking less slippery and safe for all vehicle.
 (a) Skid Resistance (b) Wear Resistance
 (c) Alkali Resistance (d) Stain Resistance
- (10) p-Toluenesulphonyl Isocyanate is a mono-functional Isocyanate commonly used as a _____ in 2K PU Varnish .
 (a) Catalyst (b) Scavenger
 (c) Reactive Diluent (d) Light Stabilizer.
- (11) Film formation of Nitrocellulose lacquer is done by _____.
 (a) Solvent Evaporation & Chemical curing
 (b) Solvent Evaporation
 (c) Solvent Evaporation & Oxidative Polymerization
 (d) Radiation Polymerization
- (12) _____ is a hybrid water base organic and inorganic traffic yellow road marking paint ideal for interior and exterior line striping.
 (a) Sodium Silicate (b) Potassium Silicate
 (c) Lithium Silicate (d) Ethyl Silicate
- Q.2** Attempt **Any Eight** of the following. **(16)**
- (1) Write the guide values for pigment to binder ratios for oxidatively cured primer, primer surfacer and top coats.
 - (2) How Cellulose Nitrate (NC) is prepared from Cellulose, explain with chemical reaction.
 - (3) What are the different methods by which film formation is executed?
 - (4) What is Stoving Enamel? Write the chemical reaction for stoving enamel based on blocked polyisocyanates.
 - (5) For what reasons water-borne paints are increasingly being used. Highlight the important properties of Water.
 - (6) Write the ingredient used in water based paints.
 - (7) Calculate the Tg of the NC ½: Alkyd Resin: Plasticizer from the given ratio (1:1:0.1).
 - (8) What is Hydrophobicity?
 - (9) Write about Varnishes.
 - (10) List the varieties of Road marking paints.
- Q.3** Formulate Oxidative Curable White Glossy top coat for industrial application **(08)**
 using below data and Calculate Wt/Ltr, %NVM, %PVC, % Volume Solids.
 • Given: P/B = 0.8 : 1.0 (Pigment/Binder ratio), %NVM = 64.65
 • Alkyd Resin (Supplied in 55% in MTO, Specific Gravity= 1.2)
 • TiO₂ (Rutile) = 4.1
- OR**
- Q.3** Discuss the various coats necessary for *automotive coating* systems? **(08)**
Q.4 Write a note on Epoxy Reactive Surfactant (ERS). **(08)**
- OR**
- Q.4** List the types of Emulsion used in architectural coating. Discuss the important **(08)**
 properties of Emulsion Polymers.
Q.5 Give the recipe for Cold applied White pure acrylic base road marking paint. **(08)**
- OR**
- Q.5** Write a note on Road Marking Paints. **(08)**
Q.6 List and discuss the different wood finish coating systems. **(08)**
- OR**
- Q.6** a. Write about French Polish and its formulations. **(04)**
 b. List commercially available Novelty Finishes. Explain about Hammer tone **(04)**
 Paint.

Seat No. _____

Enrolment No. _____

THE CHARUTAR VIDYA MANDAL UNIVERSITY

M.Sc. Surface Coating Technology – SEMESTER 3

NOVEMBER 2021 EXAMINATION

Course Title: TECHNOLOGY OF PACKAGING AND PRINTING INK

Course Code: 101470308

Total Printed Pages: 02

Date: 19/11/2021

Time: 1:30 pm to 3:30 pm

Maximum Marks: 60

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.

(12)

- 1 Which printing is not called as planography printing process?
a. Letterpress b. Lithography c. Flexographic d. Gravure
- 2 The approximate ink-film thickness applied to the substrate from the Offset Lithography printing process is _____.
a. 1.5-2.5 μm b. 3-4 μm c. 2-4 μm d. 7-8 μm
- 3 In ____ printing process, the printing and nonprinting parts are on the same level.
a. Letterpress b. Lithography c. Flexographic d. Gravure
- 4 _____printing process is also called as silk printing process.
a. Letterpress b. Lithography c. Screen d. Gravure
- 5 _____ spray the ink directly through a series of holes onto the surface of paper as the printhead scans back and forth across the paper.
a. Ink jet printer b. Photocopy c. Thermal printers d. Ribbons
- 6 With _____, the imaging is carried out on the basis of photo-electronic effects.
a. electrophotography b. ionography c. magnetography d. thermography
- 7 _____ is used for bulk handling, warehouse, storage and transport shipping.
a. Primary b. Secondary c. Tertiary d. None of these
- 8 Choose non-basic functions of packaging?
a. Inform b. Motivate c. Protect d. Convenient
- 9 Which printing is not called as planography printing process?
a. Letterpress b. Lithography c. Flexographic d. Gravure
- 10 which of the following is used to pack carbonated soft drinks?
a. HDPE b. PET c. PS d. PVC
- 11 What is the function of Polyethylene in Tetrapack?
a. Mechanical rigidity b. Gas barrier c. Abrasion resistance d. Liquid barrier
- 12 Which is the thinnest layer in Tetrapack?
a. Polyethylene b. Aluminium c. Paper d. Nylon

Q.2 Attempt ANY EIGHT of the following.

(16)

- 1 Give classification of impact printing process.
- 2 Write principle of Lithography printing process.
- 3 What is meant by 'offset' in OSL printing?
- 4 Enlist approximate thickness obtained by various impact printing process.
- 5 In which printing process Dampening solution are used? Why?
- 6 Classify non-impact printing process.
- 7 State the purpose of anilox roller in flexo printing machine.
- 8 What is packaging? Enlist function of it.
- 9 What is biotic spoilage and abiotic spoilage?
- 10 What is shelf life?

Q.3 Discuss in detail factors to be consider during ink formulation.

(08)

OR

Q.3 What are the different methods by which printing inks dry? Discuss in detail.

(08)

Q.4 Write a note on toners used for NIP processes.

(08)

OR

Q.4 Classify inkjet printing process and discuss in detail printing ink used for it.

(08)

Q.5 Explain preservation function of packaging in detail.

(08)

OR

Q.5 Write a note on tetra pack aseptic processing and packaging.

(08)

Q.6 Discuss properties, uses, advantages and disadvantages of aluminium used as packaging material.

(08)

OR

Q.6 Write a note on glass used as packaging material.

(08)
