SARDAR PATEL UNIVERSITY

M.Sc. 3ʳᵈ Semester (Surface Coating Technology) (CBCS) Examination
Tuesday, 19ᵗʰ March 2019
Time: 02:00 pm to 05:00 pm
Course No.: PS03CSCT21
Subject: Technology of Resins for Surface Coatings- I

Total Marks: 70

N.B. (1) Marks allotted to the question are on its RHS
(2) Illustrate your answers wherever necessary with the help of neat sketches & chemical equations

Choose the correct answer from the following

Q.1. 1 Water soluble resole are prepared using an F: P ratio of about ____and reaction is brought about under highly _____ conditions. (1)
(a) 1.74 : 1 and Alkaline (b) 1.75 : 1 and Acidic (c) 0.89 : 1 and Alkaline (d) 0.85 : 1 and Acidic

Q.1. 2 _____ is a main functional raw material for Unsaturated Polyester resin systems containing reactive diluents. (1)
(a) Phthalic Anhydride (b) Maleic Anhydride
(c) Trimelletic Anhydride (d) Propylene Glycol

Q.1. 3 The main ingredient in oxidative cured coating is _____. (1)
(a) Corn Oil (b) Cottonseed oil (c) Linseed oil (d) Castor Oil

Q.1. 4 The major problem with _____ system is poor hydrolytic stability due to the presence of easily hydrolyzed ester linkages. (1)
(a) Alkyd Emulsion (b) Self Emulsifying Alkyd (c) Water Reducible Alkyd (d) None of these

Q.1. 5 If the situation does get out of hand, and in extreme cases, the addition of _____ catalyst is recommended while processing of Saturated Polyester resin. (1)
(a) Esterification (b) Etherification (c) De-esterification (d) Inhibitors

Q.1. 6 _____ monomer gives Exterior Durability, Hardness, Stain and Water resistance film properties (1)
(a) Styrene (b) Vinyl Acetate (c) Butyl Acrylate (d) Methyl Methacrylate.

Q.1. 7 _____ is a trade name of Du Pont (1)
(a) TEFLON (b) DYNEON (c) FLUON (d) DAIKIN-POLYFLON

Q.1. 8 Minimum Film Forming Temperature is governed by _____ of the polymer. (1)
(a) M_n (b) M_w / M_n (c) T_g (d) M_w

Q.2 Attempt **any Seven** Questions (14)
(a) Calculate the amount of Pentaerythritol require to complete neutralization of 100 gms of Rosin. Consider 90% of acid in Rosin.
(b) What is Shellac? Explain the properties and application of Shellac in surface coatings.
(c) Write a brief note on Alcoholysis Process.
(d) Describe the advantages and disadvantages of the use of fatty acid as opposed to oils.
(e) Describe the advantages of solvent process over fusion process in alkyd resin manufacture.
(f) Justify the statement that "8 to 10 % of Methanol is added as a stabilizer in formalin".
(g) Write the synthesis reaction of Resoles in Phenolic Resin.
(h) Give the recipe of Thermoset Acrylic resin? (Calculate its Final Tg value, Hydroxyl Value at 55% Solids of copolymer solution)
(i) Discuss about Polyvinyl Butyral resin.

(P.T.O.)

Q.3 a Explain the methylolation stage and alkylation stage in the synthesis of Butylated Melamine formaldehyde resin. (6)

Q.3 b Write the factors influencing the choice of Alcohol used for Alkylation's in making of Amino resins. (6)

OR

Q.3 a Explain the making of Rosin Modified Maleic resins (RMM) along with its properties and uses. (6)

Q.3 b Explain the making of Resole and Rosin Modified Phenolic resin (RMP) along with its properties and uses. (6)

Q.4 a Write a note on Self-emulsifying Alkyd resins. (6)

Q.4 b Define Oil Length and $P_{gel\ point}$. Derive the fundamental equation of $P_{gel\ point} = 2\ m_0 / e_0$. (6)

OR

Q.4 b Calculate R, K, P, F_{avg}, Water of Reaction, Oil length, % Yield, Initial Acid Value and Hydroxyl Value in finished Short oil Alkyd resin. (6)

Sr. No	Ingredients	Weight (in Gms)
1	Soyabean Oil	66.5
2	Phthalic Anhydride	24.0
3	Pentaerythritol	12.9

Q.5 a Give the chemical reactions (Reaction 7 to 11) for the modification and curing reaction in Saturated polyester resin. (6)

Q.5 b With a neat sketch explain the plant requirement for the production of Polyester resin. Describe the processing of polyester resin. (6)

OR

Q.5 b Write the Quality control tests carried out by the process chemist for raw materials, process control of the cook and of finished resin to ensure that the saturated polyester resin produced is within that specification. (6)

Q.6 a Match A with B with C (6)

Monomers (A)	Chemical Formulae (B)	Properties (C)
1. Methyl Methacrylate	a. $CH_2= CH\ C_6H_5$	I. Offers better solvent solubility and much more flexible & extensible.
2. Styrene	b. $CH_2=C(CH_3)-COOCH_3$	II. Surface wetting and substrate adhesion.
3. Meth acrylic Acid	c. $CH_2=C(CH_3)-COOC_4H_9$	III. Contributes to hardness, Chemical resistance and economy.
4. Butyl Methacrylate	d. $CH_2=C(CH_3)-COOH$	IV. Contributes to hardness, tensile strength and color stability.

Q.6 b Explain Drip feed solution polymerization process along with its advantages and Calculate Tg of a copolymer with 10% Styrene, 15% MMA, 15 % Butyl acrylate, 10% HEMA, 25 % Butyl Acetate and 23 % Xylene 2 % BPO. (6)
(Tg of Styrene= 100°C , MMA = 103°C, BA = -- 54°C and HEMA = 85 °C)

OR

Q.6 b Explain in details about Emulsion Polymerization method to produce Pure Acrylic Emulsion. (6)

———✗———

②