

## SARDAR PATEL UNIVERSITY

M.Sc. (3<sup>rd</sup> Semester) Surface Coating Technology Examination (CBCS), October 2016

PS03CSCT01: Technology of Resins for Surface Coatings- 1

Time: 02:00 pm to 5:00 pm

Saturday, 22<sup>nd</sup> October 2016

Total Marks: 70

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 The main ingredient in oxidative cured coating is \_\_\_\_\_. (1)  
(a) Phthalic anhydride (b) Fish oil (c) Mineral oil (d) Castor Oil
- Q.1. 3 The major problem with Water Reducible alkyd system is \_\_\_\_\_ due to the presence of easily hydrolyzed ester linkages. (1)  
(a) Poor acid resistance (b) Poor hydrolytic stability (c) Poor colour stability (d) Poor Odour
- Q.1. 4 Solid Thermo Plastic Acrylic resins are formulated to a molecular weight range between \_\_\_\_\_ & \_\_\_\_\_. (1)  
(a) 2000 & 20000 (b) 15000 & 50000 (c) 30000 & 200000 (d) 100000 & 500000
- Q.1. 5 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.1. 6 A branched tertiary structure with bulky and \_\_\_\_\_ provides Veova 10 monomer with a very low surface tension. (1)  
(a) Hydrophobic groups (b) Hydrophilic groups (c) Acid Group (d) Ester Linkage
- Q.1. 7 \_\_\_\_\_ film has outstanding weatherproof properties and resistance to radiation. (1)  
(a) PVC (b) PVDF (c) PVB (d) CPVC
- Q.1. 8 Chlorosulphonated polyethylene can be cross-linked by the way of sulphonyl groups with \_\_\_\_\_. (1)  
(a) Isocyanate (b) Polyamides (c) Amino resin (d) Metal Oxides

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) Explain in brief about Ester Gum.
- (c) Write a brief note on Alcoholysis Process.
- (d) Describe the advantages of solvent process over fusion process in alkyd resin manufacture.
- (e) Write a chemical reaction used in synthesis of Saturated polyester resin (Reaction-1 to 3).
- (f) Discuss the significance of reaction temperature for polyester resin manufacture, with respect to polybasic acid.
- (g) Write the commercially available emulsions describing their particle size range which affects the paint properties.
- (h) Write a brief note on Emulsion free lattices-Resin supported systems.
- (i) List the grades of Resoles in Phenolic Resin and Explain one of them in brief.
- Q.3 a List various substituted Phenols available in the market with their structure and functionality. (6)
- Q.3 b Write a note on Epoxy Phenolic 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)

(P.T.O.)

- Q.4 a Define Oil Length and  $P_{gel\ point}$ . Derive the fundamental equation of  $P_{gel\ point} = 2 m_o / e_o$ . (6)
- 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. (Eq Wt of Soyabean Oil= 293, Phthalic Anhydride= 74.1, Pentaerythritol= 35.5) (6)

Sr. No	Ingredients	Equivalence ( $e_o$ )
1	Soyabean Oil	0.2269
2	Phthalic Anhydride	0.3243
3	Pentaerythritol	0.3633

OR

- Q.4 a Write a note on Self-emulsifying Alkyd resins. (6)
- Q.4 b Formulate an alkyd resin with 55 % oil length (Soyabean Oil) with Pentaerythritol as polyol with 7% 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. (6)
- Q.5 a Formulate oil-free polyester resin based on 20.40 : 24.81 : 18.51 weight (in gms) of Isophthalic acid : Terphthalic acid : Phthalic Anhydride with target acid value of 5 using neopentyl glycol, 1,3 hexane diol and Ethylene glycol (19.31:21.41:7.61 weight (in gms). Calculate the water of esterification, % Yield, Excess Hydroxyl, Hydroxyl number,  $F_{avg}$ ,  $P_{gel}$  and molecular weight. (Eq Wt of IPA=83, TPA = 83, PA = 74, NPG = 52, 1,3 hexane diol=59 and EG=31). (6)
- Q.5 b Give the chemical reactions (Reaction 7 to 11) for the modification and curing reaction in Saturated polyester resin. (6)

OR

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

Monomers (A)	Properties (B)
Methyl Methacrylate	Offers better solvent solubility & much more flexible & extensible.
Styrene	Surface wetting and substrate adhesion.
Meth acrylic Acid	Contributes to hardness, Chemical resistance and economy.
Butyl Methacrylate	Contributes to hardness, tensile strength and color stability.
Isobutyl Methacrylate	Highly Elastic and tacky homopolymer
2-Ethyl Hexyl acrylate	Good water resistance.

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

OR

- Q.6 b Who invented PTFE (Teflon)? Write a note on PTFE. (6)