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SARDAR PATEL UNIVERSITY

VALLABH VIDYANAGAR

M.Sc. (3<sup>rd</sup> Semester) Surface Coating Technology Examination (CBCS), November 2012

PS03CSCT01: Technology of Resins for Surface Coatings- 1

Time: 02:30 pm to 5:30 pm

Thursday, 29<sup>th</sup> November 2012

Total Marks: 70

- Q.1 Choose the correct answer from the followings:
- Q.1.1 Gilsonite, or North American Asphaltum is a natural, \_\_\_\_\_ found in the Uintah Basin in northeastern Utah. 1  
(a) Resinous hydrocarbon (b) Soft hydrocarbon (c) Resinous fluorocarbon (d) Soft fluorocarbon
- Q.1.2 Option \_\_\_\_\_ is barely used in coatings applications as it has a tendency to yellow. 1  
(a) Acyl peroxide & Tertiary aromatic amine (b) Acyl peroxide & heavy metal salt  
(c) UV Radiation & heavy metal salt (d) Benzoylperoxide & UV radiation.
- Q.1.3 In Alkaline solutions at elevated temperatures, formaldehyde under goes Cannizaro's reaction yielding \_\_\_\_\_ and \_\_\_\_\_ which tend to lower pH and consequently alkali has to be added, during the methylolation reaction to keep the pH constant. 1  
(a) Methanol & Formic Acid (b) Ethanol & Acetic Acid (c) Butanol & Formic Acid (d) Methanol & Acetic Acid.
- Q.1.4 Novalac 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.1.5 If the situation does get out of hand, and in extreme cases, the addition of \_\_\_\_\_ catalyst is recommended while processing of Polyester resin. 1  
(a) Esterification (b) Etherification (c) De-esterification (d) Inhibitors
- Q.1.6 \_\_\_\_\_ is use to build up higher molecular weight resin because of its greater tendency to cyclization with diols. 1  
(a) Phthalic Anhydride (b) Isophthalic Acid (c) Phthalic Acid (d) Trimellitic Anhydride.
- Q.1.7 Application solids of Acrylic Automotive Topcoats will be higher in \_\_\_\_\_. 1  
(a) Thermosetting Acrylic (b) Thermoplastic Acrylic (c) Acrylic Aqueous Dispersion (d) None of these.
- Q.1.8 For exterior protection of metal cladding for buildings which coil coating system gives 20 years of guarantee in exterior durability. 1  
(a) PVDF and TPA (b) PVDF and Epoxy (c) PVDF and TSA (d) PVDF and Teflon

Q.2 Attempt any Seven Questions:

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- (a) Write in brief about Coal Tar Pitch.
- (b) Calculate the amount of Pentaerythritol require to complete neutralization of 100 gms of Rosin. Consider 90% of acid in Rosin.
- (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) List the various phenols along with its functionality used for making Phenolic resins..
- (h) Why methacrylates over acrylates are preferred for the exterior applications in preparing acrylic resins.
- (i) Give the recipe of Thermosetting Acrylic resin ? ( %NVM 60%, Hydroxyl value of 65 mg of KOH/gm of sample)

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

Q.3 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      | Coconut Oil        | 32              |
| 2      | Phthalic Anhydride | 42              |
| 3      | Glycerin           | 26              |

Or

Q.3 b Write a note on:

- (1) Self-emulsifying Alkyd emulsions. 3
- (2) Urethane modified alkyd resin. 3

Q.4 a List the grades of Resoles in Phenolic Resin and Explain one of them in detail. 6

- Q.4 b (1) Write the factors influencing the choice of Alcohol used for Alkylation's in making of Amino resins. 3
- (2) Write the structures for the 1,3,5-Triazine-2,4,6-triamine, Benzoguanamine, Glycolril. 3

Or

Q.4 b Explain the methylolation stage and alkylation stage in the synthesis of Butylated Melamine formaldehyde resin. 6

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 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 neo-pentyl 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

Or

- Q.5 b Give the chemical reactions (Reaction 7 to 11) for the modification and curing reaction in Saturated polyester resin. 6
- Q.6 a Write the curing and film forming reactions of the hydroxyl, Glycidyl and carboxyl functional groups incorporated in Acrylic resins for use in surface coating applications. 6
- Q.6 b Write a note on Fluorinated Polyethylene's. 6

Or

- Q.6 b Give the recipe of High Solid Coating resins? Explain the effects of selecting different initiators on the properties of resin. 6
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