[28] Seat No.: _____ No. of Printed pages: 2

SARDAR PATEL UNIVERSITY

M.Sc. 1st Semester (Surface Coating Technology) Examination (CBCS)

Thursday, October 27th 2016

Time: 10:00 am to 1:00 pm

Course No. : PS01CSCT03

Subject: Surface Chemistry & Surface Engineering

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

Q.1 **Choose the correct option.**

(1) A liquid does not wet the surface of solid if the contact of angle is _____. (1)
A. 0° B. An acute one
C. 45° D. An obtuse one

(2) When the angle of contact between solid and liquid is 90°, then _____. (1)
A. Cohesive forces > Adhesive forces B. Cohesive forces < Adhesive forces
C. Cohesive forces = Adhesive forces D. Cohesive forces >> Adhesive forces

(3) A surfactant which hydrates in water, primarily by hydrogen bonding through its oxygen content is called _____. (1)
A. anionic surfactant B. cationic surfactant
C. nonionic surfactant D. amphoteric surfactant

(4) Particle speed in case of wire flame spray method is approximately (1)
A. 3 m/sec B. 30 m/sec
C. 300 m/sec D. 3000 m/sec

(5) The process in which the source material is converted to molten state before coating is (1)
A. Thermally sprayed coating B. Electro-plating
C. Physical vapour deposition D. Cold gas dynamic spray

(6) The nozzle used in cold gas dynamic spray for increasing particle velocity is (1)
A. Convergent nozzle B. Convergent-Divergent nozzle
C. Divergent nozzle D. None of the above

(7) The adhesion strength of thermally sprayed coating is affected by (1)
A. Porosities B. Unmelts
C. Oxidation of material being coated D. All of the above

(8) The process in which surface properties of substrate are changed without adding any material is (1)
A. Micro Arc Oxidation B. Electro-plating technique
C. Wire arc spray D. Chemical vapour deposition

Q.2 Answer **any seven** of the following (14)

1 What is Surface tension? List the methods used to measure surface tension.
2 Explain in brief about Critical Solid Surface tension.
3 Twelve drops of paint solvent, collected over a 5-min period from a drop weight tensiometer (critical outside bottom radius 0.274 cm) weigh 0.362 g. Calculate the solvent surface tension.
4 Define Cloud Point & Krafft Point.
5 What is HLB value and why it is important?
6 Explain the principle of micro arc oxidation.
7 List at least four applications of surface engineering indicating the properties of surface enhanced.
8 Briefly describe the principle of formation of diamond like coating.
9 Classify Physical Vapour Deposition method based on the principle used for separating atoms from source material.

Q.3(a) How weight drop method can be used for determining liquid surface tension? Explain the simplified tensiometer design based on this principle. (6)

(b) Describe the process of wetting by penetration? Derive equation for work of penetration. (6)

OR

(b) Calculate the surface tension of Hexane, Xylene & Acetone. Parachor values of Carbon, Hydrogen and Oxygen, Double bond & Ring structure are 4.8, 17.1, 20.0, 23.2 and 6.1 respectively. Density of Hexane, Xylene and Acetone are 0.655, 0.87 & 0.792 g/cc respectively. (6)

Q.4(a) What are surfactants? Give the detailed classification of them by giving at least two examples for each class. (6)

(b) Explain in detail about Electrical Double Layer theory. (6)

OR

(b) What are emulsions? How are they formed? Explain different types of emulsions? (6)

Q.5(a) Classify thermally sprayed coating and explain wire flame spray method of coating with the help of neat sketch stating its advantages and limitations. (6)

(b) Define the term plasma and describe Plasma spray method of spraying with the help of neat sketch stating its advantages and limitations. (6)

OR

(b) Describe the process of Electro spark coating method with the help of neat sketch stating its advantages and limitations. (6)

Q.6(a) Explain the principle of Physical Vapour Deposition by sputtering, with the help of neat and labeled diagram. (6)

(b) Describe any six methods for surface preparation before coating. (6)

OR

(b) List different test procedures used for testing properties of coatings and describe any one in detail. (6)

****