Unit I

Chapter 1 : Cement and Concrete 1-1 to 1-28

Types of cements, Bogue's compounds, structure of a hydrated cement paste, volume of hydrated product, porosity of cement paste, interfacial transition zone in concrete (ITZ), influence of ITZ on properties of concrete, types of elastic moduli, factors affecting elastic modulus of concrete.

Unit II

Fly ash, blast furnace slag, silica fume, rice husk ash, metakaolin, industrial waste or by-products, chemical composition and classification, effect on hydration process of portland cement, effect on workability of concrete, effect on the properties of hardened concrete, effect on durability of concrete.

Unit III

Classification of admixtures, chemistry and mechanism, effect of admixtures on plastic properties and hardened properties of concrete, applications, specialty admixtures - viscosity modifying admixtures, corrosion-inhibiting admixtures, shrinkage-reducing admixtures.

Unit IV

Types of fibers, matrix, stress transfer mechanism, steel fiber reinforced concrete (SFRC) – types of steel fibers, balling effect, effect on properties of hardened concrete, applications, slurry infiltrated fiber concrete (SIFCON) - fresh and hardened properties of SIFCON, applications, synthetic fiber reinforced concrete – types of synthetic fibers, properties of fibers, effect of fibers on properties of concrete, applications

Unit V

Chapter 5 : Durability of Concrete 5-1 to 5-11

Plastic shrinkage, autogenous shrinkage, drying shrinkage, mitigation strategies, transport properties of concrete, permeability, corrosion, chloride penetration, carbonation, sulphate attack and acid attack.

Unit VI

Chapter 6 : Testing of Concrete 6-1 to 6-13

Ultrasonic pulse velocity method: theory of pulse propagation through concrete, interpretation of results, corrosion : half-cell potential measurement, electrical resistivity method, permeability and absorption tests, concrete cores – core location and size, drilling, testing and interpretation of results, in-situ load testing.

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