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| **Scheme of Valuation/Answer Key**  (Scheme of evaluation (marks in brackets) and answers of problems/key) | | | | | |
| **APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  V SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018 | | | | | |
| **Course Code: CE361** | | | | | |
| |  | | --- | | **Course Name: ADVANCED CONCRETE TECHNOLOGY** | | | | | | |
| Max. Marks: 100 | | |  | Duration: 3 Hours | |
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| **PART A** | | | | | |
|  |  | ***Answer any two full questions, each carries 15 marks.*** | | | Marks |
| 1 | a) | Effect of superplasticizers on fresh concrete (with respect to water reduction, workability, bleeding and segregation) – 2.5 marks  Effect of superplasticizers on hardened concrete (strength) – 2.5 marks | | | (5) |
|  | b) | Need for artificial aggregates – 1 mark  Any 2 artificial aggregates (such as air cooled slag aggregate, sintered flyash aggregate, manufactured sand etc.) – 4 marks | | | (5) |
|  | c) | Properties of air entraining admixtures (Any 3 properties) – 3 marks  Uses of air entraining admixtures (Any 2 uses) – 2 marks | | | (5) |
| 2 | a) | Explanation for bleeding in concrete (2 marks). Any 3 methods of controlling it.  (3 marks) | | | (5) |
|  | b) | Effect of size of aggregate on workability, strength, durability – 2 marks  Effect of shape of aggregate on workability, strength, durability – 2 marks | | | (4) |
|  | c) | What is soundness and causes of unsoundness – 2 marks  Le-Chatelier’s test or Autoclave test – 4 marks | | | (6) |
| 3 | a) | Increased water content, use of spherical mineral admixtures, use of chemical admixtures, use of air entrainment, use of well graded and rounded aggregates, use of smooth textured aggregates, use of maximum size of aggregates (7 points) | | | (7) |
|  | b) | Properties of C2S, C3S, C3A and C4AF with respect to setting, strength and durability (4 × 1 = 4 marks) | | | (4) |
|  | c) | Methods for sampling: Quartering (2 marks) and Riffling (2 marks) | | | (4) |
| **PART B** | | | | | |
| ***Answer any two full questions, each carries 15 marks.*** | | | | | |
| 4 | a) | lower HoH, lower thermal shrinkage, reduced permeability, enhanced durability due to pore refinement, reduces alkali aggregate reaction, improved resistance against sulphate attack and other chemical attacks, lower cost, sustainability, lowers air pollution etc. Any 6 points – 6 marks | | | (6) |
|  | b) | Typical stress-strain behaviour of concrete (Figure) – 2 marks  Explanation of salient points – 2 marks | | | (4) |
|  | c) | Factors affecting strength of concrete: water to cement ratio, aggregate to cement ratio, age, grading of aggregate, size, shape and texture of aggregate, strength and stiffness of aggregate, size of specimen, gel-space ratio etc. Any 5 factors – 5 marks | | | (5) |
| 5 | a) | Influence of silica fume on fresh concrete – 2 marks  Influence of silica fume on hardened concrete (strength and durability) – 3 marks | | | (5) |
|  | b) | Definition and explanation of shrinkage – 1 mark  Types of shrinkage (plastic, autogenous, drying and carbonation) – 4 marks | | | (5) |
|  | c) | Factors affecting modulus of elasticity of concrete: Mix proportion, richness of the mix, strength of concrete, water to cement ratio, state of wetness, age, test method (static or dynamic), method of curing (normal or steam), aggregate properties etc. Any 5 factors – 5 marks | | | (5) |
| 6 | a) | Determination of target strength, fixing of water to cement ratio & cement content, proportion of volume of coarse and fine aggregate content, estimation of contents of constituents based on volume, formulation of trial mix  (Any 4 main steps – 8 marks) | | | (8) |
|  | b) | Objectives: to produce a concrete that is workable, free from bleeding and segregation, of enough strength and durability, and economical.  Any 3 objectives – 3 marks | | | (3) |
|  | c) | Effect of creep in RCC beams, RCC columns, eccentrically loaded columns, in beam-column junctions, restrained shrinkage conditions, in dams, in pre-stressed concrete.  Any 4 effects of creep – 4 marks | | | (4) |
| **PART C** | | | | | |
| ***Answer any two full questions, each carries20 marks.*** | | | | | |
| 7 | a) | Smoothness of contact surface under test, influence of path length, temperature of concrete, moisture condition of concrete, presence of reinforcing steel, accuracy of measurement. Any 3 factors with explanation – 6 marks | | | (6) |
|  | b) | Factors such as relative fibre matrix stiffness, type of fibre, fibre geometry, fibre content, orientation of fibres, mixing and compaction techniques, size and shape of aggregate etc. Any 3 factors with explanation – 6 marks | | | (6) |
|  | c) | Explanation of sulphate attack phenomenon and its causes – 4 marks  Control measures (use of sulphate resisting cement, quality concrete (low water to cement ratio), use of air entrainment (up to 6%), high pressure steam curing, use of high alumina cement, use of slag as mineral admixture etc.  Any 4 control measures – 4 marks | | | (8) |
| 8 | a) | Composition and properties of mass concrete – 3 marks  Note on slip form construction with its advantages – 3 marks | | | (6) |
|  | b) | Advantages: Reduces cost, material, time and manpower, Shuttering and scaffolding are not necessary in site, Installation of services and finishes can be done immediately, Cannot be affected by weather conditions, Good quality components can be produced due to close supervision, Clean and dry work in site, Permits alteration and reuse, Correct shape, dimensions and sharp edges are maintained, Very thin sections can be cast with precision.  Any 4 advantages – 1.5 marks each | | | (6) |
|  | c) | Figure of Schmidt rebound hammer test – 2 marks  Test procedure – 4 marks  Interpretation of strength from the test results (Figure) – 2 marks | | | (8) |
| 9 | a) | Slump flow test, T50 cm slump flow test, J ring test, V funnel test, V funnel test at T5 minutes, L box test, U box test.  Any 3 test methods with explanation – 6 marks | | | (6) |
|  | b) | Strength reduction above 300 ˚C, distortion, buckling and cracking, spalling of concrete surfaces, localised bursting of small pieces of concrete, conversion of cement paste to quicklime resulting in disintegration of concrete, reinforcing steel loses tensile capacity, buckling of steel and loss of bond to adjacent concrete. Any 3 effects of fire with explanation – 6 marks | | | (6) |
|  | c) | Mix composition of high strength concrete (low water to cement ratio, use of mineral and chemical admixtures) – 3 marks  Hardened properties of high strength concrete (any 2) – 3 marks  Uses of high strength concrete (any 2) – 2 marks | | | (8) |
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