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| **APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  SIXTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), MAY 2019 |
| **Course Code: CE362** |
| **Course Name: Ground Improvement Techniques** |

Scheme of Evaluation

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| **Qn.No** | **Answer** | **Marks** |
| **PART A** | | |
| 1 a) | Ground improvement potential  -definition  -potential for hazardous, poor and favourable soils | 2  3 |
| b) | Applications of grouting  -seepage control  -soil stabilization and solidification  -vibration control | 2 marks for each point  4 marks for fig |
| 2 a) | -Mechanical modification (Compaction, vibro floatation)  -Hydraulic modification (Dewatering methods)  -Physical and chemical modification(Rock bolting, soil nailing, grouting)  -Modification by inclusion and confinement(Geotextile, geogrid )  -Combination of the above | 8 |
| b) | -permeation grouting -definition with figure | 7 |
| 3 a) | Aspects of grouting -3 basic functions -permeation, compaction and hydraulic fracturing  Factors affecting grouting -grain size of grout, size of voids,pumping pressure,grout viscosity., permeability and shear strength of soil | 4  4 |
| b) | Jet grouting-procedure with figure | 7 |
| **PART B** | | |
| 4 a) | Mechanism of lime stabilization -colloidal type reaction and cementing process-explanation | 5 |
| b) | Ground anchors-definition  Components-anchorage, unbonded length, bond length  Applications-anchoring sheet pile walls, resisting uplift in hydraulic structures, stabilize landslides, prevent rock falls, prevent heave of soils, tie down pipeline | 2  8 |
| 5 a) | Lime fixation point-during initial addition periods of lime addition, plastic limit increases but after a certain point, plastic limit starts decreasing  Optimum lime content -amount of lime require for satisfying immediate soil-lime interaction , still providing sufficient amount of free calcium and residual pH necessary to initiate long-term pozzolanic reaction | 3  3 |
| b) | Effect of lime on soils-effect on plasticity, density and strength  -addition of lime reduces MDD and increases OMC  -resistance to water absorption, capillary rise, volume changes  -increased workability  -increase in particle size  -increased internal friction among agglomerates | 9 |
| 6 a) | Cement stabilization process- pulverization of soil, addition of water and cement, mixing, compacting, finishing and curing | 7 |
| b) | Soil nailing-definition  Main components-steel bar, centralizer, beraing plate and nut assembly, facing  Applications-excavation support, tunnel and slope stabilization  Brief explanation of construction sequence | 8 |
| **PART C** | | |
| 7 a) | Depth of penetration-0.4WH0.5=0.4x40x200.5=71.55m | 8 |
| b) | Methods of dewatering-open sumps and ditches, well point systems, deep well drainage, vacuum dewatering system, dewatering by electro-osmosis | 12 |
| 8 a) | Compaction control tests-destructive and non destructive  Destructive-core cutter, sand replacement, Proctor needle methods  Non-destructive-nuclear gauge -method, Hills method | 10 |
| 9 a) | Properties of compacted soil-increase in dry density, decrease in moisture content, reduction of permeability and compressibility, increase in shear strength, reduction in swelling and shrinkage | 10 |
| b) | Vacuum dewatering-explanation with fig  Electro osmosis-explanation with fig | 5 |
| c) | Shallow surface compaction-tampers, rollers -smooth wheel, sheepsfoot, grid, pneumatic tyred  Deep compaction-dynamic compaction, vibro-compaction, vibro-flotation, vibro-displacement(Sand compaction piles, stone columns), explosion by blasting  (Listing only) | 5 |