Course of Written Test for Project Support Engineers (Grade-II)

Full Marks: 100
Pass Marks: 50

1. Introduction----------------- 2 Marks
   • National transport policy
   • National road transport priorities and strategies
   • Institutional organization for road transport sector
   • SRN, LRN

2. Road alignment----------5 Marks
   • Guidelines for alignment selection
   • Use of secondary data
   • Computer application in alignment selection

3. Geometric design --------5 Marks
   • Design criteria selection
   • Design concepts of various geometric elements (design speed, curve radius, super elevation, extra widening, sight distances, transition curves, gradient selection, horizontal curves (use of compound curves and reverse curves) and vertical curves, traffic capacity etc.)
   • Computer application in geometric design of road

4. Road drainage----------5 Marks
   • Design of side drains, cross drainage structures, sub surface drainage structures
   • Slope stabilization, energy dissipating structures, bioengineering works for road side slope stabilization

5. Hill roads---------------- 10 Marks
   • Alignment selection in hills, design of hair pin bends, design of retaining structures

6. Traffic studies-------------5 Marks
   • Traffic counts
   • Traffic threshold for road upgradation
   • Placement of signs, signals and markings and other road furniture
   • Traffic control
   • Road accident and prevention

7. Road materials--------------10 Marks
   • Soil, aggregate, bitumen, cement
   • Tests required for road materials

8. Road pavement-------------10 Marks
   • Selection of pavement types and components
   • Design factors to be considered
   • Design methods of flexible pavement (IRC 37-2001, Road note 31, NRS, AI method)

9. Road construction---------15 Marks
   • Low cost roads (material specification, tools and equipments, construction methodology, supervision and quality control)
- Bituminous roads (material specification, tools and equipments, construction methodology, supervision and quality control)
- Cement concrete roads (material specification, tools and equipments, construction methodology, supervision and quality control)
- Construction schedule and progress report
- Billing and as built drawings preparation
- Environmental and social impacts assessment

10. Road maintenance and rehabilitation---------5 Marks
- Issues and importance
- Maintenance management system

11. Road bridges and tunnels-------------5 Marks
- Bridge classification, bridge site location, bridge type selection
- Requirements of road tunnel
- Construction technology of bridge and tunnel
- River training works

12. Estimating and costing---------------3 Marks
- Methods of estimate
- Units of measurement and payment
- Rate analysis
- Quantity estimate of different items of works
- Specification, valuation, depreciation

13. Construction planning and management-------5 Marks
- Scheduling of works, bar charts, PERT, CPM, S curve
- Methods of execution
- Tender and tender documents
- Agreement
- Steel structures: Tension and compression members, plate girders and steel trusses.

14. Surveying--------------5 Marks
- Classification of survey, scales, accuracy, measurement of distance
- Compass, leveling, trigonometric leveling
- Theodolite surveying
- Tacheometric survey, contours
- Digital elevation model concept
- Establishments of control by triangulation and traversing, measurement and adjustment of observations
- Concept of global positioning concept(GPS), remote sensing
- Use of state of the art survey equipments in road survey and design

15. Soil mechanics and foundation------------10 Marks
- Soil and sub-soil: constituents, types of soils, classification and identification of soils, soil tests; Proctor compaction test, moisture content determination, consolidation and density tests, liquid and plastic limit tests, shear box and triaxial test, bearing tests, vane tests, penetration tests, CBR test
- Load and bearing capacity of soils: Field methods of exploration of strata, extent and depth of exploration, trial pits and boring, Augurs, loading test on foundation, bearing plates
- Design of foundation: Safe load on common soils, superimposed loads, depth of foundation, design of footing, causes of failures of foundation and remedial measures, improving bearing capacity of soils; grillage and raft foundation, foundation in black cotton soils
- Piles: typed, bearing piles, friction piles, testing piles for loads, pile foundation for bridges, sheet piling, choice of piles and spacing.