Syllabus for Written Test for PhD Civil Engineering

Candidate shall attempt <u>any ONE SECTION</u> of choice.

Section A

1. **Structural Engineering**
   Fundamentals of Engineering mechanics, solid mechanics, structural analysis, design of RCC structures, design of steel structures, structural dynamics, construction materials and management, Earthquake Engineering.

Section B

2. **Water Resources Engineering**
   Fluid Mechanics, Hydrology: Precipitation, Stream flow measurements, Hydrographs, Flood and Flood Routing, Open Channel Hydraulics : Introduction, Uniform Flow, Energy-Depth Relationships, Gradually Varied Flow-Theory & Computations, Rapidly Varied Flow-Hydraulic Jump, Unsteady Flows, Irrigation Engineering: Irrigation Demand, Canal Irrigation System, Sediment transport in Irrigation Channels, Design of Irrigation Channels, Lining of Irrigation Channels, Water Supply Engineering: Estimation of water demand, Transporting water through conduits, Distribution system for water supply.

Section C

3. **Geotechnical Engineering**

   Index and engineering properties of soils, slope stability, subsurface exploration, shallow foundations, deep foundations, earth retaining structures, ground improvement techniques.

Section D

4. **Transportation Engineering**
- Traffic Engineering – Fundamental parameters of Traffic Flow: Macroscopic and Microscopic Time space diagram : one vehicle & multiple vehicle Fundamental flow diagram : Speed Vs density; flow Vs density; speed Vs flow, Flow Models
- Highway Geometric Design – Horizontal and Vertical Alignment, Sight Distance, etc.
- Pavement Engineering – Pavement design, Pavement materials, Pavement maintenance.

Section E

5. **Environmental Engineering**
- Water treatment: Sources of water, Quality and quantity of water, Drinking water standards, water requirements, water chemistry, basic unit operations and processes for water treatment.
- Wastewater treatment: Primary, secondary and tertiary treatment of wastewater, sludge disposal, effluent discharge standards.
- Air Pollution: Types of pollutants, their sources and impacts, Air quality standards, air pollution meteorology.

Section F

6. **Remote Sensing**

- Introduction to Remote Sensing: remote sensing advantages and limitations; The remote sensing process: Remote sensing data collection, Types of resolution, Multispectral imaging, Hyperspectral imaging, LiDAR and RADAR remote sensing
- Radiometric and Geometric Correction: Atmospheric windows; Unnecessary and Necessary Atmospheric Correction, Internal and External Geometric error, Image to map rectification, Image to image registration, Ground control points (GCPs), Spatial and Intensity interpolation, Root mean square error (RMSE).
- Pattern Recognition: Fundamentals of quantitative analysis, Sub-classes and Spectral classes, Supervised classification, Unsupervised classification, Object-based image analysis (OBIA) classification, Accuracy assessment: Error matrix.

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