Civil Engineering Department

SYLLABUS FOR PhD ENTRANCE EXAM IN CIVIL ENGINEERING

ENVIRONMENTAL ENGG.

Physical, chemical and biological parameters, standards (drinking water and wastewater effluent), Gas transfer processes, sedimentation, coagulation flocculation, disinfection, filtration in water treatment system; Water treatment system. technologies to purify water; Fundamentals of wastewater treatments system, details of different aerobic processes and anaerobic processes; Solid waste (E-waste/ C&D /biomedical/plastic) management and treatment technologies; Measurement and control of principal air pollutants, global challenges of air pollution, measurement and control of noise pollution; Concept and application of EIA; LEED rating and Green Buildings; Instrumentation for measurement of water/water water/air/noise

Sample Questions:

1. How does carbon monoxide affect the human body?

a) It does not allow binding of oxygen with haemoglobin
b) It reduces the surface area of the alveoli and disrupts gaseous transfers
c) It causes the liver to malfunction, increasing bile secretion
d) It reduces the body's tendency to absorb water thereby making us feel dehydrate

2. Disinfection is the function of which of the following variables?

i. Concentration of disinfectant
ii. Concentration of organisms
iii. Temperature
iv. Time of contact

a) i, ii
b) i, ii, iii
c) i, ii, iii, iv
d) ii, iii, iv

Q.3. Which of the following is correct regarding disposal of waste by land filling?

a) Economical method
b) Preferred in low lying areas
c) Foul gases are not produced
d) Separation of different types of waste not required

Q.4. Which method of population forecast is suitable when extension is required for small duration and past record is available for long duration?

a) Graphical comparison method
b) Graphical extension method
c) Logistic curve method
d) Zoning method

Q.5. Estimate the water content of air that is in equilibrium with pure water at 68oF = 20 oC

a) 0.045 b) 0.054
c) 0.078 d) 0.023

GEOTECHNICAL ENGG.

Soil and soil–mass constituents, classification of soil, index properties of soil, stresses in soil mass, compressibility and consolidation of soil, soil compaction, shear strength of soil. Stresses in soil under surface loading, stability of slopes, earth pressure and retaining walls, bearing capacity of soils, site investigations, methods of explorations. Shallow and deep foundation, settlement under foundation, foundation on difficult soils. Soil stabilization, ground improvement by drainage and grouting, geo-reinforcement and introduction to geosynthetics.

Sample Questions:

1. A dry sand specimen was tested in a tri-axial machine with the cell pressure of 50 kPa. If the deviator stress at failure was 100 kPa, the angle of shearing resistance is

(a) 30° (b) 15° (c) 45° (d) 60°

2. A gravity R.W. of top width 1 m and base width 3 m and total height of 10 m (γ_{wall} = 22 kN/m^3) is retaining dry cohesionless backfill of γ = 20 kN/m^3 and $\phi = 30°$, then the F.S. against sliding will be,
   (a) 2.3 (b) 1.3 (c) 3.3 (d) 2.5

3. Total number of stress components at a point within a soil mass loaded at its boundary is
   (a) 3 (b) 6 (c) 9 (d)16

4.The bearing capacity of piles is determined by
   a) Dynamic formula b) Static formula
   c) Pile load tests d) All the above

5. If geosynthetic allows for adequate fluid flow with limited migration of soil particles across its plane over a projected service lifetime of the application under consideration, then this function of geosynthetic is called
   (a) Filtration.
   (b) Separation.
   (c) Drainage.
   (d) Fluid barrier.

STRUCTURAL ENGG.

Bending moment and shear force diagram; Analysis of trusses, arches, beams, cables and frames; Stiffness and Flexibility methods;Design of concrete and steel structures; Concrete mix design; Codal provisions; Working stress and Limit state design of beams, slabs and columns; Pre-stressed concrete; Design of tension and compression members; Seismic analysis.

Sample Questions:

1. Workability of concrete can be improved by
   a) More sand
   b) More cement
   c) More fine aggregates
   d) Fineness of coarse aggregate
2. Lug angles
   a) Are used to reduce the length of connection
   b) Are unequal angles
   c) Increases shear lag
   d) All of the above
3. On which of the following concepts is the basic principle of structural design based?
   a) Weak column strong beam
   b) Strong column and weak beam
   c) Equally strong column beam
   d) Partial weak column beam
4. A pre-stressed concrete beam has a cross section with the following properties:
   $A = 46{,}400\ mm^2$ $I = 75.8 \times 10^7 mm^4$
   $Y_{bottom} = 244mm$ $y_{top} = 156mm$
   It is subjected to a pre-stressing force at an eccentricity 'e' so as to have a zero stress at the top fibre. The value of 'e' is given by
   a) 66.66mmb) 66.95mm
   c) 104.72 mm d) 133.33 mm
5. If a point load acting at the mid-span of a fixed beam of uniform section produces fixed end moment of 60 kN-m, then the same load spread uniformly over the entire span will produce fixed end moments equal to
   a) 20 kN-m b) 30 kN-m
   c) 40 kN-m d) 45 kN-m

TRANSPORTATION ENGG.

Soil, Cement, Aggregate and Bitumen types and related tests. Road user characteristics and vehicular characteristics, different types of traffic studies, traffic controls and operations. Design and construction of flexible and rigid pavement and their failures. Travel demand estimation and forecasting. Principles of intersection design and point of conflict at intersections. Highway subgrade, low cost roads.

Sample Questions:

1.In travel demand modeling, trip distribution belongs to the
(a) first stage (b) second stage (c) third stage (d) none of these

2. Which machine is preferred for abrasion test?
(a) Vicat's mould(b) Los Angeles(c) Flakiness Gauge(d) Elongation Gauge

3. The "3-Es" of traffic engineering stand for?
(a) Enforcement, empowerment and eradication(b) Engineering, education and expulsion
(c) Engineering, education and enforcement(d) Engineering, education and enthusiasm

4. The camber is checked at every interval of _____
(a) 10 m(b) 20 m(c) 30 m(d) 40 m

5. An intersection that is provided for different levels of road is called _____
(a) Intersection at grade(b) Rotary intersection
(c) Channelized intersection(d) Grade separated intersections

WRE

Hydrology, Hydro-meteorology, Measurement of surface flow, Evaporation, Infiltration, Runoff, Hydrograph analyses, Flood Routing, Statistical methods in hydrology, Hydrology of floods and droughts

Free surface flow, Watershed hydrology, Irrigation water management, Design of irrigation structures, Ground water hydrology, Contaminant transport, Climate change variability and adaption, Hydrological disaster management, Remote sensing, GIS, Water resources planning and management.

Sample Questions:

1. If a stream function is given by $\psi = x^3 - y^3$, then
   a) It is an unsteady, an irrotational flow case
   b) A potential function exists
   c) It is a steady, an irrotational flow
   d) It is a possible flow, rotational flow case

2. A 6-hr unit hydrograph is triangular in shape with a base of 75 hr and a peak discharge of 12 m^3/ s. This unit hydrograph refers to a catchment of area, in km^2
   a) 65 b) 162 c) 320 d) 1800

3. A canal is to be carried over a natural drainage. Which structure will you provide at this place
   a) A syphon b) An aqueduct c) A bridge d) A cross-drainage structure

4. An 8 hour storm had 8 cm of rainfall, and the resulting runoff was 4 cm. If the ϕ – index remains at the same value, a rainfall of 12 cm in a 15 hour storm produces a runoff in this catchment of
   a) 4.5 cm b) 6.0 cm c) 8.0 cm d) 10.5 cm

5. A straight line is fitted to a plot between return period on logarithmic scale and flood peak on an ordinary scale. The 10 year and 100 year floods are obtained as 110 cumecs and 220 cumecs respectively. What would be the magnitude of 1000 year flood
   a) 330 cumecs b) 440 cumecs c) 550 cumecs d) 660 cumecs