2016-17
B.E. (III YEAR) EXAMINATION
CIVIL ENGINEERING
DESIGN OF CONCRETE STRUCTURE-I
ECE-311

Maximum Marks: 60 Duration: Two Hours

Answer all the questions.
Assume suitable data if missing. Notations used have their usual meaning.
Use of IS: 456-2000 Code is allowed and list the relevant clauses of the code while solving the problem.
Only design charts of SP16 are allowed

Q.No. Question M.M.
1 Design a doubly reinforced section for a simply supported rectangular beam of effective span 3.75 m. The superimposed live load is 40 kN/m and the size of the beam is limited to 250 × 400 mm overall. Provide nominal clear cover to meet the requirement of fire resistance rating of 2hrs and durability requirements for “very severe” exposure. Assume concrete grade as M25 and steel grade as Fe 415. Show the reinforcement details with neat sketches. [12]

2 (a) Sketch the cracking pattern in a simply supported beam under the combined action of flexure and shear. [04]

2 (b) A R.C. beam has an effective depth of 450 mm and breath of 300 mm. It contains 2-25 mm Fe415 grade bars in tension and M20 mix. Design the shear reinforcement needed for a factored shear force of 250 kN. Also show the details of shear reinforcement in a section. [08]

3(a) Describe the following: [04]
(i) Functions of longitudinal and transverse reinforcement in compression members
(ii) Failure modes of short and long column

3(b) Design and check the strength of a short column with the following data: [08]
Size of column = 450 mm; Concrete grade = M20; Steel grade
is Fe415; Ultimate load = 1000 kN; Ultimate moments $M_{ux} = 75$ kNm and $M_{uy} = 60$ kNm. Also show the details of reinforcement.

**OR**

3'(b) Design a short rectangular R.C. column to carry a ultimate axial load of 1500kN and an ultimate bending moment of 75 kNm is effectively held in position at both ends and restrained against rotation at one end. The unsupported length of the column is 4m. Use M20 concrete mix and Fe415 steel grade. Assume clear cover is 40mm. Also show the details of reinforcement.

4 Determine only the depth of a slab of a multi panel floor system with all four edges continuous and effective spans of 4.2 m × 4.2 m. Assume a live load of 3.5 kN/m² and a floor finish of 1 kN/m². Assume concrete grade as M20 and steel grade as Fe415. No checks are required. Without calculating the positive and negative steel show the reinforcement details in one of the directions in middle strip as per IS: 456-2000.

**OR**

4' (a) Show a neat sketch of punching shear failure in flat slabs and explain how it can be avoided.

4' (b) Determine only the depth of interior panel of a flat slab. The slab is supported on columns spaced at 6m in both the directions. The size of the column is 550 mm × 550 mm. Assume a live load of 3.5 kN/m² and a floor finish of 1 kN/m². Height of the column is 6 m. Assume concrete grade as M25 and steel grade as Fe 415. Neither checks nor calculation of steel is required.

5 Determine only the depth of the footing of a square column of size 300 × 300 mm with 8# 16 mm diameter to carry a working load of 900 kN such that it is safe in punching shear for the following data:

- Bearing Capacity of Soil: 100 kN/sq.m,
- Concrete grade: M20 and Steel grade Fe415.

Without calculating the steel in footing give a neat sketch of reinforcement detail of the footing and column.
2016-17
III YEAR BE. V SEMESTER EXAMINATION
DEPARTMENT OF CIVIL ENGINEERING
SOIL MECHANICS
ECE-312

Maximum Marks: 60
Duration: Two Hours

Answer all the questions.
Assume suitable data, if missing.
Notations used have their usual meaning.

S. No. | Questions | MM
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Q1a | Enumerate various methods used to determine in-situ density of soil and explain Sand Replacement method, in detail. | [06]
Q1b | The liquid limit and plastic values of a soil are 50% and 25% respectively. When the soil was dried from its state at liquid limit, the decrease in volume was 40% of the volume at liquid limit. When it was dried from its state at plastic limit, the decrease in volume was 20% of the volume at plastic limit. Determine the shrinkage limit. | [06]

OR

Q1b' | What is compaction? Describe the various factors affecting compaction process. | [06]
Q2a | Explain Darcy's law. Discuss the factors affecting permeability of soil. | [04]
Q2b | Derive the relationship to determine the average permeability perpendicular to the bedding plane in a soil mass. Calculate the average permeability values of a soil mass in horizontal and vertical directions if the values of coefficient of permeability are $45 \times 10^{-6}$, $27 \times 10^{-6}$ & $15 \times 10^{-6}$ m/sec of the 3 layers of soil having thicknesses of 300cm, 500cm & 200cm respectively. | [08]

OR

Q2b' | A Falling Head Permeability test is carried out on a 10cm long sample of silty clay. The diameters of sample & stand pipe are 5.5cm and 0.8cm respectively. The water level in the stand pipe is observed to fall from 65cm to 35cm in 9 minutes. Determine:

(a) The coefficient of permeability in meters per day.
(b) Height of water level in stand pipe after 18min.
(c) Time required for water level to drop by 5cm | [08]

[Cont'd... 2]
Q3 Write down the assumptions made by Boussinesq in computation of vertical stresses under the surface footing. Derive an expression for the vertical stresses under uniformly distributed circular area.

OR

A rectangular footing of size 5m x 2m is loaded with uniformly distributed load of intensity 120kN/m². Compute the vertical pressure at a depth of 5m for the following conditions:

(a) At the centre
(b) At any corner of the footing.

Q4a Define any TWO of the following terms:

(a) Coefficient of compressibility
(b) Compression index
(c) Over consolidation ratio
(d) Over consolidated soil

Q4b A soft normally consolidated clay layer is 20m thick with a moisture content of 45%. The clay has a saturated unit weight of 20kN/m³, specific gravity of 2.7 and liquid limit of 60%. A foundation load will subject the centre of layer to a vertical stress increase 10kPa. Assume GWT at the surface of clay layer. Estimate:

(a) The initial and final effective stresses at the centre of the layer
(b) Compression index
(c) The consolidation settlement of clay layer.

Q5a Discuss Mohr-Coulomb equation of failure.

Q5b List various laboratory tests to determine shear strength of soil. Discuss Direct Shear test, in detail.
2016-17
B.E. (AUTUMN SEMESTER) EXAMINATION
CIVIL ENGINEERING
ENVIRONMENTAL ENGINEERING
ECE 313 N

Maximum Marks: 60 Credits: 04 Duration: Two Hours

Answer all the questions.
Assume suitable data if missing.
Notations used have their usual meaning. Use of Nomograph and partially flow diagram permitted.

Q.No.  Question  
1 (a) What do you understand by Indicator Organisms?  [02]
1 (b) Briefly describe the different methods of population forecasting. Explain any two of them.  [06]
1 (c) Explain how variations in water demand are met out?  [02]
1 (d) List the different types of filters used in water treatment. Describe mixed media filter.  [05]

2 (a) Design a sedimentation tank for the treatment of 10 MLD of water. Assume SOR as 25 m³/m².d  [05]

2 (b) Water with the following properties was softened by lime soda process. Calculate the amount of lime and soda process for the treatment of 10 MLD of water assuming the purity of lime as 70% and soda ash as 80%  [10]

\[
\begin{align*}
\text{CO}_2 &= 8.8 \text{ mg/L}, \quad \text{Ca}^{++} = 40 \text{ mg/L}, \quad \text{Mg}^{++} = 14.7 \text{ mg/L}, \quad \text{Na}^{+} = 13.7 \text{ mg/L} \\
\text{HCO}_3^{-} &= 135 \text{ mg/L}, \quad \text{SO}_4^{2-} = 29 \text{ mg/L}, \quad \text{Cl}^{-} = 17.8 \text{ mg/L}
\end{align*}
\]

OR

2' (a) A BOD analysis began on Monday. Thirty (30 mL) of waste with a DO of zero is mixed with 270 mL of dilution water with a DO of 9 mg/L. The sample is then put in an incubator. Since the 5th day falls on Saturday and the laboratory was closed until Monday, the seventh day. The final DO was measured was 4.0 mg/L. It was also discovered that the incubator was set at 30°C. Take K₂₀ as 0.23 d⁻¹. Determine 5...
day 20°C BOD of the sample.

2'(b) Draw water treatment flowsheets for surface and ground water sources. Explain the purpose of aeration.

2'(c) Describe hardy cross method in detail and write the different equations involved.

3(a) Differentiate between coarse and fine screens.

3(b) Briefly explain how only inorganic solids are removed in grit channel and not organic ones. Design a grit channel for the treatment of 10 MLD of wastewater assuming settling velocity as 0.02 m/s and horizontal velocity as 0.3 m/s

3(c) Briefly describe the objectives of biological treatment. Differentiate between the BOD removal mechanism in an activated sludge process and trickling filter.

OR

3'(c) Write down the advantages of anaerobic treatment processes. Draw the sketch of UASB process and briefly explain its functioning.

4(a) Design a septic tank for 40 users assuming wastewater contribution per person as 50 L/d and period of cleaning as two years.

4(b) Differentiate between different types of ponds. Describe BOD removal mechanism in a pond.

4(e) Briefly describe the sources and characteristics of municipal solid waste
2016-17
B.E.AUTUMN (V SEMESTER) EXAMINATION
(CIVIL ENGINEERING)
DAM ENGINEERING
(ECE-428)
Credits: 04
Duration: Two Hours

Maximum Marks: 60

Answer all the questions.
Assume suitable data if missing.
Notations used have their usual meaning.

Q.No.       Question                                                                                                  M.M.
(a) Write short note on site selection of a gravity dam.                                                             [05]
(b) Calculate the factor of safety against sliding for a gravity dam profile as shown in Fig.1. Analysis is to be carried out under the influence of following forces:
Weight of dam ($\gamma_m = 25$ kN/m$^3$); Water pressure ($\gamma_w = 10$ kN/m$^3$); Wave pressure ($F= 13$Km, $V = 88$ Kmph); Uplift force ($C = 0.7$); Coefficient of friction ($\mu = 0.65$)

[Diagram showing a gravity dam profile with dimensions and forces indicated]

Fig. 1
All R.L. are in meter

OR

(b) Explain the procedure of designing a gravity dam by the method of zoning with the help of a neat sketch.  [10]

Contd... 2.
2(a) How the effect of horizontal acceleration of earthquake is considered in the design of low gravity dam? Give step-wise procedure to calculate horizontal seismic coefficient by response spectrum method. [10]

2(b) Write short notes on temperature control in mass concreting. [05]

OR

2'(b) Differentiate between a low and high gravity dam. Derive an expression for base width based on stress criteria. [05]

3(a) Enumerate various arch dams. Explain any one of them [05]

3(b) What is a buttress dam? Draw its neat sketch and explain the function of each component. Give two examples of buttress dams. [10]

OR

3'(b) What are the assumptions of thin cylinder theory? Show that most economical central angle of an arch dam for minimum volume of concrete is 133° 34’. [10]

4(a) Draw the neat sketch of cross section of an earth dam and show all its components. Name any three earth dams of India along with the name of rivers. [10]

4(b) Discuss hydraulic failure of earth dams. [05]

OR

4'(b) Explain any three construction equipments for earth dams. [05]