2018-19
B.Tech. (III YEAR) EXAMINATION
CIVIL ENGINEERING
DESIGN OF CONCRETE STRUCTURE-I
CE-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 attached with the paper are allowed

Q.No.  Question  M.M.

1 (a)  Give three reasons for providing cover to tension steel in a R.C beam  [3]

1 (b)  Determine the minimum effective depth required and the corresponding area of tension reinforcement for a rectangular beam having a width of 250mm to resist an ultimate moment of 200 kNm. Assume Fe415 grade steel and M20 grade concrete.  [12]

2 (a)  Prove the following expression, \[ L_d = \frac{0.87\sigma_s\phi}{4\tau_{bd}} \] where, \( L_d \) = development length; \( \sigma_s \) = stress in steel; \( \phi \) = diameter of bar and \( \tau_{bd} \) is bond stress.  [05]

2 (b)  A beam with 4#32mm diameter bars as tension steel has two bars symmetrically bent at the ends of beam at 45°. Find the vertical stirrups for resistance against shear failure at the ends if the factored shear force at the critical section is 400 kN. Assume \( b=300mm, d=550mm \) and grade of concrete and steel as M25 and Fe415 respectively.  [10]

OR

2 (b)  Determine the depth of a RC slab 6.3m×4.5m effective span with two adjacent edges continuous over support using Limit State of Serviceability and Collapse criteria and determine the area of steel in shorter direction. The design LL is 2.5kN/m². A 37.5mm thick floor finish is provided on the slab. Exposure condition of slab to environment can be classified as mild. Assume M20 concrete mix and Fe415 grade steel. Checks are not required.  [10]

3(a)  Explain the modes of failure of column.  [3+12]
3(b) Design an axially loaded tied column 400 mm × 400 mm pinned at both ends with an unsupported length of 3 m for carrying a factored axial load of 2300 kN. Justify the use of formulae for design of the column. Assume M20 mix concrete and Fe415 grade steel. Detail the column.

OR

3(a) Explain the function of transverse ties in a RC column? What happens when ties are not provided?

3'(b) A reinforced concrete column of circular cross section with unsupported length of 5.5 m is to support an axial load of 1800 kN (working) along with a factored bending moment of 150 kNm. Design a suitable cross section of column with longitudinal and transverse steel. Use the chart as attached herewith. Assume M25 mix concrete and Fe415 grade steel.

4 Determine the depth, area of steel in an isolated column footing for a column 400 × 400 mm reinforced with 8 bars of 20 mm dia. and carrying a service load of 1500 kN. Assume safe bearing capacity of soil at required depth as 150 kN/m², angle of repose for soil is 30° and density as 17 kN/m³. Also check for punching shear. Use M20 concrete mix and Fe 415 grade steel.
$f_y = 415 \text{ N/mm}^2$  
$d/D = 0.10$

$A_e = \frac{mD^2}{400}$

$-\text{AXIS OF BENDING}$

Contd...4.
Maximum Marks: 60
Duration: Two Hours

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

<table>
<thead>
<tr>
<th>Q. No.</th>
<th>Questions</th>
<th>M.M.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1(a)</td>
<td>Enumerate various methods for determining the moisture content of soil. Discuss any one of them in detail.</td>
<td>[7]</td>
</tr>
<tr>
<td>1(b)</td>
<td>In a field exploration, a soil sample was collected in a sampling tube of internal diameter 5.0cm below water table. The length of the extracted sample was 10.5cm and its weight was 450g. If G = 2.70 and the weight of the dried sample is 356g. Find the porosity, void ratio, degree of saturation, and dry density of the sample.</td>
<td>[8]</td>
</tr>
<tr>
<td>OR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1'(a)</td>
<td>Differentiate between standard and modified Proctor’s compaction tests? Discuss in brief about the various factors affecting compaction of soil.</td>
<td>[7]</td>
</tr>
<tr>
<td>1'(b)</td>
<td>Determine the stresses below a corner and center of a 3 × 4m footing that carries a uniformly distributed load of 100kN/m². The stresses are required at 6m depth below the base of the footing.</td>
<td>[8]</td>
</tr>
<tr>
<td>2(a)</td>
<td>Differentiate between seepage velocity and discharge velocity. Derive the relationship between them.</td>
<td>[7]</td>
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<tr>
<td></td>
<td>If seepage velocity is given as 0.0023cm/s and void ratio of 55%, determine its discharge velocity.</td>
<td></td>
</tr>
<tr>
<td>2(b)</td>
<td>A sample of sand, 5cm in radius and 20cm long, has a void ratio of 60% in a constant head apparatus. The total head was kept constant at 30cm and the amount of water collected in 5s was 40cm³. The test temperature was 20°C. Calculate the hydraulic conductivity and the seepage velocity.</td>
<td>[8]</td>
</tr>
<tr>
<td>3(a)</td>
<td>Discuss in detail about Height of Solids and Change in Voids Ratio methods for determining the equilibrium voids ratio.</td>
<td>[7]</td>
</tr>
<tr>
<td>3(b)</td>
<td>The voids ratio of clay sample A decreased from 0.675 to 0.610 under a change in pressure from 100 to 200kN/m². The voids ratio of another sample B decreased from 0.615 to 0.555 under the same increment of pressure. The thickness of sample A was</td>
<td>[8]</td>
</tr>
</tbody>
</table>

Contd....2.
2.0 times that of B. The time taken for 60% consolidation was 3 times more for sample A than for B. What is the ratio of coefficient of permeability of sample A to that of B.

4(a) Discuss Mohr-Coulomb failure criterion in terms of total stress and effective stress parameters. Draw Mohr Circles for \( c, c - \phi \), and \( \phi \) – type of soils.

4(b) Derive the relationship between principal stresses \( (\sigma_1 \text{ and } \sigma_3) \) and shear strength parameters \( (c \text{ and } \phi) \).

OR

4’a) An unconfined compression test was carried out on a saturated clay sample. The maximum load this sample sustained was 127N and the vertical displacement was 0.8 mm. The size of the sample was 38mm diameter 76mm long. Determine the undrained shear strength.

4’(b) Enumerate different type of laboratory shear strength tests. Explain Triaxial test in detail.
## Answer all the questions.
Assume suitable data if missing.
Notations used have their usual meaning.
Use of Nomographs and partially flow diagram permitted

<table>
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<tr>
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<tr>
<td>1 (a)</td>
<td>Briefly explain the different components of wastewater collection systems.</td>
<td>[05]</td>
</tr>
<tr>
<td>1 (b)</td>
<td>A 600 mm diameter sewer is laid at a slope of 0.004 m/m. Find the depth of flow and the velocity in sewer if the sewer is flowing at 60% of its capacity</td>
<td>[05]</td>
</tr>
<tr>
<td>1 (c)</td>
<td>Differentiate between separate and combined sewerage systems. Highlight their merits and demerits</td>
<td>[05]</td>
</tr>
<tr>
<td>2 (a)</td>
<td>Differentiate between a PFTR and a CSTR and draw their hydraulic profiles under pulse and continuous inputs of tracer.</td>
<td>[05]</td>
</tr>
</tbody>
</table>

**OR**

<table>
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<tr>
<th>Q.No.</th>
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<th>M.M.</th>
</tr>
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<tbody>
<tr>
<td>2' (a)</td>
<td>Determine the number of completely mixed reactors required to reduce the bacterial count of wastewater sample from $10^5$ org./mL to 25 organism/mL assume the value first order reaction rate constant as 6.5 hr$^{-1}$. Assume contact time as 30 minutes</td>
<td>[05]</td>
</tr>
<tr>
<td>2 (b)</td>
<td>Find out the terminal settling velocity of a grit particle 0.2 mm settling in wastewater. Take the value of dynamic viscosity as $1.002 \times 10^{-3}$ N s/m$^2$ and specific gravity as 2.65</td>
<td>[05]</td>
</tr>
<tr>
<td>2 (c)</td>
<td>Briefly explain the significance of dilution in BOD determination. In a BOD determination 6 mL of wastewater containing no dissolved oxygen is mixed with 294 mL of dilution water containing 8.6 mg/l of dissolved oxygen. After a 5 day incubation at 20°C, the dissolved oxygen content of the mixture is 5.4 mg/l. Calculate the BOD of the wastewater.</td>
<td>[05]</td>
</tr>
</tbody>
</table>
3 (a) Classify stabilization ponds in the form of a table showing all the parameters. Show neat sketches of Inlet, Outlet arrangements and typical embankment of a pond.

The average operational record at an activated sludge plant at 20°C is shown below:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wastewater flow rate</td>
<td>7570 m³/d</td>
</tr>
<tr>
<td>Volume of aeration tank</td>
<td>2260 m³</td>
</tr>
<tr>
<td>Influent BOD₅ after PST</td>
<td>143 mg/L</td>
</tr>
<tr>
<td>Effluent BOD₅</td>
<td>20 mg/L</td>
</tr>
<tr>
<td>Influent TSS</td>
<td>125 mg/L</td>
</tr>
<tr>
<td>Effluent TSS</td>
<td>24 mg/L</td>
</tr>
<tr>
<td>Effluent VSS</td>
<td>19.2 mg/L</td>
</tr>
<tr>
<td>Return Sludge flow</td>
<td>3180 m³/d</td>
</tr>
<tr>
<td>MLSS</td>
<td>2600 mg/L</td>
</tr>
<tr>
<td>MLVSS/MLSS ratio</td>
<td>0.8</td>
</tr>
<tr>
<td>Excess Sludge VSS</td>
<td>7120 mg/L</td>
</tr>
<tr>
<td>Excess Sludge flow rate</td>
<td>200 m³/d</td>
</tr>
</tbody>
</table>

Calculate the OLR, F/M ratio, HRT, SRT, return sludge recirculation ratio, BOD and TSS removal efficiencies. Draw ASP diagram showing all flow rates and concentrations.

OR

3' (b) Design the trickling filters giving identical BOD₅ efficiency and recirculation rate using NRC equations for a two stage scheme. The required data is given below:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wastewater flow rate</td>
<td>3785 m³/d</td>
</tr>
<tr>
<td>Influent BOD₅ after PST</td>
<td>195 mg/L</td>
</tr>
<tr>
<td>Effluent BOD₅</td>
<td>20 mg/L</td>
</tr>
<tr>
<td>Effective depth of filter</td>
<td>2 m</td>
</tr>
<tr>
<td>Recirculation ratio to each filter</td>
<td>1.8</td>
</tr>
</tbody>
</table>

Also calculate BOD loading rate and volumetric loading rates to each filter.

4 (a) Briefly explain the working of Mass Burn Incineration used for solid waste management. Support your answer with a diagram.

4 (b) What is indoor air pollution? What are the measure indoor air pollutants and their sources?

4 (c) What are the different factors on which composting process depends? Discuss the effect of temperature and pH on compost pile?

OR

4' (e) Discuss the landfill gas composition inside the landfills with respect to age of landfill.
2018-19
B.TECH. (AUTUMN SEMESTER) EXAMINATION
CIVIL ENGINEERING
ENVIRONMENTAL ENGINEERING
CE 313 N

Maximum Marks: 60
Credits: 04
Duration: Three 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                               Marks
-------------  --------------------------------------  ----
1 (a)         What do you understand by Indicator Organisms?  [02]
1 (b)         Describe the procedure of determination of water demand of a town. Explain how variations in water demand are met out?  [09]
1 (c)         Differentiate between the qualities of surface and ground water sources of water supply  [04]
2 (a)         Briefly explain coagulation and flocculation process in water treatment. Write the chemical equation involved using Alum as coagulant and find the amount of alkalinity requirement per gram of Alum.  [05]
2 (b)         Describe Lime Soda process of water treatment. Write the different chemical equations used.  [04]
2 (c)         Discuss in detail the Hardy Cross method of water distribution.  [06]

OR

2’ (a)        Briefly explain why BOD₅ does not measure nitrogenous demand? The 5 day 20°C BOD of a wastewater sample was 250 mg/L. Find out 3 day 27°C BOD assume K₂₀ as 0.23 day⁻¹.  [05]
2’(b)         Draw water treatment flowsheets for surface and ground water sources. Explain the purpose of aeration.  [05]
2’(c)         With the help of sketches explain the different layout of water distribution pipe networks  [05]

Contd...
3(a) Draw sewage treatment flow sheet mentioning primary, secondary and tertiary treatment. Your scheme should also include the sludge handling units

3(b) Design a two stage high rate trickling filter for the treatment of 10 MLD of sewage having initial BOD of 160 mg/L. It is desired that the BOD of the treated wastewater is 30 mg/L. Assume R=1.

3(c) Briefly explain the BOD removal in stabilization pond

4(a) Define the various functional elements involved in solid waste management

OR

4'(a) Design a septic tank for 50 users assuming wastewater contribution per person as 60 L/d and period of cleaning as three years.

4(b) Describe the working of a secured landfill. What are the objectives of providing covers and liners in a secured landfill?

4(c) Describe the functioning of Activated Sludge Process.
Department of Civil Engineering, A.M.U., Aligarh
B. Tech. 3rd Year V Semester (Civil)

End Semester Examination -2018-19
Traffic Engineering (CE-423)

Attempt all questions.
Assume suitable data, if not given.
Notations used have their usual meaning.

M.M. 60
Time: Two Hours

Q. No. Question M.M. 
1(a) Discuss the direct and the indirect factors behind the implementation of a new transportation system. [07]
1(b) What is the general form of a four-stage travel demand modeling? Write down the two basic functions of trip generation modelling. Also define the following terms: Links, nodes, centroids and external stations. [08]

OR

1(b') Given that a zone has 300 household with car and 300 household without car and the average trip generation rate for each group is 6.0 and 2.5 trips per day. Assume that in future all the household will have a car. Find the growth factor and future trips from the zone. Assume that population and income will remains constant. [08]

2(a) Discuss in detail different methods of origin and destination study. What are the methods (3-Es) for the reduction in accident rates? Discuss all of them in detail. [07]

2(b) Explain various types of speed. A vehicle was stopped in 1.4 seconds by fully jamming the brakes and the skid marks measured 7.0 meter. Determine the average skid resistance. Discuss the PIEV theory in brief. [08]

3(a) The width of a carriage way approaching an intersection is given as 15 m. The entry and exit widths at the rotary are 10 m. The traffic approaching the intersection from the four sides is shown in the Fig. 1. Find the capacity of the rotary using the given data. [07]

Fig. 1

contd...
3(b) What are the different types of vehicular movements at the junction? What do you mean by conflict points at junctions? Show with a neat sketch the number of conflict types for a conventional intersection and a roundabout junction.

OR

3(b') Discuss and sketch the various types of *On Street Parking*.

4 (a) Draw any four of the following traffic signs. Coloring is not compulsory.

i. Narrow road ahead
ii. Staggered intersection
iii. Overtaking prohibited
iv. Width limit
v. Parking both sides
vi. No through road

4 (b) An isolated traffic signal with pedestrian indication is to be installed on a right-angled intersection with road A, 18 m wide and road B, 12 m wide. During the peak hour traffic volume per hour per lane of road A and B are 275 and 225 respectively. The approach speeds are 55 and 40 km/hr on roads A and B respectively. Assume pedestrian crossing speed as 1.2 m/s. Design the timings of two phase traffic and pedestrian signals by approximate method.