2017-18
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 attached are allowed

Q.No.  Question  M.M.
1 (a) Explain the behaviour of T beam at mid span and support through sketches.  [03]
1 (b) A T- beam continuous over several supports carry a factored negative support moment of 900 kNm. Determine the area of steel at supports if \( b_w = 400 \text{ mm} \), \( b_f = 1600 \text{ mm} \), \( d' = 60 \text{ mm} \), \( D = 610 \text{ mm} \), \( D_f = 100 \text{ mm} \). Assume Fe415 grade steel and M30 grade concrete.  [12]

2 (a) Describe the role of shear stirrups in the design of reinforced concrete (RC) beam.  [03]
2 (b) A simply supported beam of effective span 6.3 m whose cross-section is reinforced with 2\#20 mm + 2\#25 mm diameter bars. The width of support is 300 mm. Factored shear force is 250 kN. Use M20 and Fe415. Using the following data: \( D = 450 \text{ mm} \), \( d' = 50 \text{ mm} \), and \( b = 250 \text{ mm} \) and holder bars of 12 mm diameter. Determine (i) Shear resisted by concrete when all the bars are continued into support (ii) Use bent up bars and find its contribution in shear.  [12]

OR

2'(a) Explain punching shear failure in flat slabs  [03]
2'(a) A slab of 3 \times 4.5 m is simply supported on 250 mm thick brick walls. The imposed load on the slab is 2.5 kN/m². Find the depth of the slab and steel only in shorter direction. Explain whether the slab needs any corner steel as reinforcement. Assume M20 concrete mix and Fe415 grade steel. Show the reinforcement detail.  [12]

contd... 2.
3(a) Describe the following:

(i) Draw the strain and stress distribution across the depth of a column under axial compression and uniaxial bending for all the cases of positions of neutral axis.

(ii) Draw the $P - M$ interaction curve for axially loaded column and describe its salient feature.

3(b) Calculate the ultimate load carrying capacity of axially loaded column of 400 mm diameter and reinforced with 8 numbers of 20 mm diameter steel bars of Fe415 grade and M25 concrete grade. The column is helically reinforced by 8 mm diameter bars at 45 mm pitch. The clear cover to the reinforcement is 40 mm.

OR

3'(b) Design a R.C. short circular column to carry a working axial load of 1000 kN and an ultimate bending moment of 60 kNm is effectively held in position at both ends and restrained against rotation at one end. The unsupported length of the column is 4 m. Use M20 grade of concrete and Fe415 grade of steel. Assume clear cover is 40 mm. Also show the details of reinforcement.

4 Determine the depth of foundation and reinforcement for limit state of collapse in bending of a brick wall 40 cm thick and transmitting a load of 120 kN/m throughout its length. The bearing capacity of the soil is 100 kN/m$^2$. Also check the depth of footing in shear. The unit weight of earth is 15 kN/m$^3$. Use M20 concrete mix and Fe415 grade steel.
\[ f_y = 415 \text{ N/mm}^2 \quad d'/D = 0.20 \]

\[ A_e = \pi D^2 / 400. \]

Axis of Bending

\[ P_u / f_{ck}D^4 \]

\[ M_u / f_{ck}D^5 \]
Maximum Marks: 60
Duration: Two Hours

Answer all the questions.
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<table>
<thead>
<tr>
<th>Q.No.</th>
<th>Question</th>
<th>M.M.</th>
</tr>
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<tbody>
<tr>
<td>1(a)</td>
<td>Differentiate between compaction &amp; consolidation? Describe the various factors affecting compaction process.</td>
<td>7.5</td>
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<tr>
<td></td>
<td>OR</td>
<td></td>
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<tr>
<td>1(a)'</td>
<td>The values of liquid limit, plastic limit and shrinkage limit of a soil were reported as 60%, 30% &amp; 20% respectively. If a sample of this soil at liquid limit has a volume of 40 cm$^3$ and its volume measured at shrinkage limit was 23.5 cm$^3$, determine the specific gravity of the solids. What is the shrinkage ratio and volumetric shrinkage?</td>
<td>7.5</td>
</tr>
<tr>
<td>1(b)</td>
<td>A concentrated load of 80 kN acts on the surface of a soil. Determine and plot the variation of vertical stresses due to the load on a horizontal plane at a depth of 2 m up to a horizontal distance of 5 m on either sides of point of application of load at an interval of 1 m.</td>
<td>7.5</td>
</tr>
<tr>
<td></td>
<td>OR</td>
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<tr>
<td>1(b)'</td>
<td>Discuss Newmark's influence chart method for determining vertical stresses under uniformly distributed loaded area of any shape.</td>
<td>7.5</td>
</tr>
<tr>
<td>2(a)</td>
<td>How the permeability gets affected due to size &amp; shape of soil particles. Derive the relationship to determine the average permeability parallel to bedding plane. Show that average permeability in parallel to a bedding plane through any stratified soil is always greater than in perpendicular direction.</td>
<td>7.5</td>
</tr>
<tr>
<td></td>
<td>OR</td>
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<tr>
<td>2(a)'</td>
<td>What is Quick sand condition? Explain the factors that influence the permeability of soil.</td>
<td>7.5</td>
</tr>
</tbody>
</table>
| 2(b)  | Compute and draw the distribution diagram of total pressure, effective pressure & pore water pressure at various depths for the soil sample as shown in Fig.1 for the following conditions:
(i) If capillary flow is neglected
(ii) If capillary flow rises up to the ground surface | 7.5  |
3(a) With the help of neat sketch discuss the laboratory consolidation test by Oedometer. Also discuss the nature of voids ratio Vs effective pressure curve for a consolidation test.

3(b) The consolidation settlement of a new structure founded on a 5 m thick layer is estimated as 8 cm. The structure was founded to have settled by 2 cm in 3 months after completion of a construction. If the clay layer is underlain by a rock and overlain by a layer of coarse sand. Determine
   
   (i) The time required for 50% consolidation to occur
   (ii) The amount of settlement which will take place in next 3 months

OR

3(b)' In a laboratory consolidation test, a 2.5 cm thick sample of clay reached 60% consolidation in 17 minutes under double drainage condition. Determine the time required for 60% consolidation of a layer of this soil in the field under the following conditions:
   
   (i) When a 3 m thick layer of the given soil is sandwiched between two sand layers
   (ii) When a 5 m thick layer of the soil is overlain by a sand layer and underlain by a deep layer of intact shale

4(a) Explain the working of triaxial shear test with diagram. Discuss the three different kinds of tests performed in a triaxial testing system in terms of drainage conditions.

4(b) Discuss the significance of Vane shear test.

A vane shear test was carried out in the field to determine the shearing strength of a deep seated layer of soft clay. The vane was 11.25 cm high and 7.5 cm across the blades. The equivalent torque recorded at the torque head at failure was 417.5 kg.cm. The vane was then rotated very rapidly in order to completely remould the soil. It was found that remoulded soil can be sheared by applying a torque of 282.2 kg.cm. Determine the shear strength of soil in undisturbed and remoulded states and its sensitivity.
Maximum Marks: 60

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

Q.No.

1 (a) What are traps? Briefly explain the different types. Support your answer with sketches. [05]

1 (b) Following are the results of a BOD experiment. Calculate $k$ and $L_0$ using method of least square

<table>
<thead>
<tr>
<th>t (d)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y$ (mg/L)</td>
<td>15</td>
<td>24</td>
<td>31</td>
<td>36</td>
<td>40</td>
<td>42</td>
</tr>
</tbody>
</table>

1 (c) Briefly explain one pipe and two pipe system of building drainage. [04]

2 (a) Draw a sewage treatment flowsheet using trickling filter as the secondary treatment system. Also mention sludge disposal system. [04]

2 (b) Define mean cells residence time, $F/M$, $K_s$, $k_d$ and $Y$ [05]

2 (c) Describe the procedure used for the determination of BOD in the laboratory. Briefly explain the necessity of dilution in BOD determination. [06]

OR

2 (c) Describe in detail the functioning of screens and grit channel in wastewater treatment [06]

3 (a) Briefly describe the need for secondary treatment. Design an activated sludge process for the treatment of 15 MLD of sewage having BOD$_5$ of 200 mg/L. Assume $k=5$ d$^{-1}$, $K_s=125$ mg/L and $O_e=10$ days. It is desired that the BOD$_5$ of treated effluent should not exceed 30 mg/L. Take $X=2500$ mg/L and $X_c=10000$ mg/L. [10]

3 (b) Describe the functioning of sequencing batch reactor. Also explain its advantages and disadvantages [05]
3'(a) Differentiate between Ponds, lagoons and Wetlands. Design a facultative pond for a flow of 5 MLD of sewage. Assume BOD loading rate as 200 Kg BOD/ha.d and inlet BOD as 120 mg/L.

3'(b) Describe the functioning of sludge digesters. With the help of sketches differentiate between standard rate and high rate sludge digesters.

3'(c) Briefly describe the necessity of wastewater disinfection. What are the various methods of wastewater disinfection?

4 (a) Briefly explain the typical composition of municipal solid waste. Find out the energy content of a municipal solid waste sample describe by the following composition

<table>
<thead>
<tr>
<th>Composition</th>
<th>Per cent by Mass</th>
<th>Typical Energy Value (KJ/Kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food Waste</td>
<td>35</td>
<td>4650</td>
</tr>
<tr>
<td>Paper</td>
<td>10</td>
<td>16750</td>
</tr>
<tr>
<td>Cardboard</td>
<td>10</td>
<td>16300</td>
</tr>
<tr>
<td>Plastics</td>
<td>10</td>
<td>32600</td>
</tr>
<tr>
<td>Garden Trimmings</td>
<td>10</td>
<td>6500</td>
</tr>
<tr>
<td>Wood</td>
<td>10</td>
<td>18600</td>
</tr>
<tr>
<td>Dirt, ash, bricks, etc</td>
<td>15</td>
<td>10500</td>
</tr>
</tbody>
</table>

4(b) Briefly describe the aerobic composting process.

4'(b) Briefly describe the functional elements of solid waste management.

4(e) Briefly explain the effects of particulates and sulphur oxides on human health.
2017-18
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.

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 l⁻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]
3 (a) | Draw sewage treatment flow sheet mentioning primary, secondary and tertiary | [04]
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.
2017-18
B.E.AUTUMN (V SEMESTER) EXAMINATION
(CIVIL ENGINEERING)
DAM ENGINEERING
(ECE-428)
Credits: 04

Maximum Marks: 60
Duration: Two Hours

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

Q.No.  Question M.M.
1(a)  Write short note on various modes of failure of gravity dam.  [05]
1(b)  Calculate the factor of safety against sliding and overturning for a gravity dam [10]
profile as shown in Fig.1. Analysis is to be carried out under the influence of
following forces:
Weight of dam \( (\gamma_m = 24 \text{ kN/m}^3) \); Water pressure \( (\gamma_w = 10 \text{ kN/m}^3) \); Wave pressure
\( (F = 14 \text{Km, } V = 92 \text{Kmph}) \); Uplift force \( (C = 0.7) \); Coefficient of friction \( (\mu = 0.6) \)

\[ 
\begin{align*}
150 & \quad \quad \quad 10 \text{ m} \\
145 & \quad \quad \quad \quad \quad \quad -100 \\
40 & \quad \quad \quad \quad \quad \quad \quad \quad \quad 1 \\
00 & \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad 0.8 \\
\end{align*}
\]

Fig. 1
All R.L. are in meter

OR

1'(b) Enumerate various forces acting on a dam. Derive an expression for principal and shear stress in case of gravity dam.  [10]
2(a) How the effect of earthquake is considered in the design of gravity dam? Give step-wise procedure to calculate earthquake forces as per response spectrum method.

2(b) Discuss the role of galleries in dams.

OR

2'(b) Based on sliding and stress criteria, derive expressions for base width for an elementary profile of a gravity dam.

3(a) Derive the expression for thickness of the arch dam and also determine central angle for minimum concrete in design of arch dam. Using thin cylinder theory.

OR

3'(a) Design a 100 m high constant angle arch dam for a valley 40 m wide at the base and 240 m wide at the height of 100 m. The permissible compressive stress is 5000 kN/m². Using thick cylinder theory

3(b) What are the considerations for the choice of a buttress dam in preference to other types? In what situations the massive head type is preferred.

4(a) Enumerate the different types of earthen dams, and draw neat sketches showing each type and also discuss the causes of failures of earthen dam.

4(b) What is meant by an 'energy dissipator'? Discuss the various methods used for energy dissipation below spillways.

OR

4'(b) Discuss the design criteria for earthen dams.