Question 1.

1. (a) What do you mean by magnitude and intensity of an earthquake? What are the different methods to estimate the magnitude of an earthquake? [05]

1. (b) Describe the earthquake resistant features for masonry buildings. [05]

1. (c) What instruments are used to record the ground motion due to earthquake and how do they work? [05]

Question 2.

2. (a) Estimate the bond and flexural tensile strength of mortar (in N/mm²) for the following data:
   Water to cement ratio by weight = 0.5; air content in mortar by volume = 20%; mortar exposure time = 90 seconds; cube size = 50 mm; mortar curing age = 28 days; age of plastic mortar = 2 hours and cement-lime ratio by volume in mortar = 0 [05]

2. (b) Determine the rigidity of shear wall with openings as shown in figure below and compare with the rigidity of solid wall for the following data:
   Modulus of elasticity of masonry = 3740 MPa; thickness of the wall = 250 mm
   door size ‘D’ = 1.2 m × 2.1 m; window size ‘W’ = 1.5 m × 1.2 m and fixed base [10]
2. (b) Determine the increase in axial load due to overturning effects of lateral force in wall with openings as shown in Figure below and compare with solid wall for the following data:
Thickness of the wall = 250 mm; door size ‘D’ = 1.2 m × 2.1 m; window size ‘W’ = 1.5 m × 1.2 m and fixed base.

3. (a) Write short notes on any three of the following:
(i) Out of plane bending
(ii) Liquefaction and its effects on structures
(iii) Explain irregularity in strength and stiffness of building
(iv) Explain the splint and bandage technique of strengthening of masonry building.

3. (b) Explain the behaviour of URM infill panel when subjected to in-plane seismic forces. How a framed building with masonry infills is modelled?

OR

3. ’(b) What is base isolation? How a structure is assessed for suitability of provision of base isolation?

4. (a) What is a soft storey? Explain the behaviour of soft first storey building. How can the sudden changes in stiffness be avoided?

4. (b) What is a response spectra of an earthquake? Plot the different response spectra. What are the steps involved in constructing a response spectra for a given ground motion?
2018-19
M. Tech. (III SEMESTER) EXAMINATION
(CIVIL ENGINEERING)
SPILLWAYS AND ENERGY DISSIPATORS
(CE-711)

Maximum Marks: 60 Credits: 04 Duration: Two Hours

Answer All Questions. Assume suitable data if missing. Notations used have their usual meaning.

Q. No. Question M.M.

1 (a) Discuss the standard ogee profiles for different u/s slopes developed by U.S. army corps of engineers at Waterways Experimental Station (WES). [7]

1 (b) Design the downstream profile of an Ogee spillway and plot the profile at a suitable scale for the following data:
   i) Design discharge for the spillway = 7500 cumecs
   ii) RL of the spillway crest = 215 m
   iii) RL of the river bed = 120 m
   iv) No. of spans = 6
   v) Length of each span = 12 m
   vi) Thickness of each pier = 2.5 m
Adopt 90° cut water nose piers and rounded abutments to execute the design. [8]

OR

1’ (a) Discuss briefly the design principles that area involved in the design of an ogee spillway. Also explain the significance of providing a projecting corbel on the upstream face of the spillway section. [7]

1’ (b) Calculate the discharge over an ogee spillway having coefficient of discharge C as 2.5 and the head over the crest excluding velocity of approach (Hd) is 12.6 m. The clear length of span is 48 m and the height of the crest above the bottom of the channel is 55 m. [8]

2 (a) Discuss the various types of energy dissipation arrangements used below spillways in relation to the positions of tailwater rating curve (TWC) and jump height curve (JHC). [8]

2 (b) Design the most suitable USBR type stilling basin for an Ogee spillway with the following data:
   i) Mean velocity of flow before jump \( V_1 = 31.6 \text{ m/s} \)
   ii) Pre-jump depth \( y_1 = 3.5 \text{ m} \) [7]

contd... 2.
Design should be accompanied by a neat sketch. Ratio of length (L) of stilling basin and sequent depth (y2) for various Froude numbers (F1) are given below:

<table>
<thead>
<tr>
<th>F1</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>8</th>
<th>10</th>
<th>12</th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td>L/y2</td>
<td>3.65</td>
<td>3.85</td>
<td>4.0</td>
<td>4.2</td>
<td>4.3</td>
<td>4.3</td>
<td>4.3</td>
</tr>
</tbody>
</table>

3 (a) Explain the working principle of saddle siphon spillway. Derive an expression for the maximum velocity of flow at the throat section of saddle siphon spillway.

OR

3' (a) Discuss the working of side channel spillway? Under what circumstances it suited the most?

3 (b) Explain the process of depriming of the saddle siphon spillway. Calculate the maximum negative pressure that would develop in the throat section of the saddle siphon spillway for the following data:

i) length of spillway L = 45 m  
ii) radius of crest and crown sections R1 and R2 = 3.5 m and 11.2 m respectively 
iii) cross sectional area of exit section A2 = 11.5 m² 
iv) head loss between throat and exit hₜ = 2.8 m

Ascertain whether cavitation in the throat section would occur or not.

4 (a) What are the merits and demerits of installing gates over spillway crest? Explain the working of a U.S.B.R. type drum gates.

4 (b) i) Write short note on Ski-jump bucket.  
ii) Derive an expression for head loss Hₜ in the entire siphon duct Hₜ=(1-C²)H

OR

4 (b') What are the main functions served by chute blocks and baffle blocks in stilling basins?

4 (c) An ogee spillway has 4.8 m head above the crest. Depth of flow at jump location is 0.85 m. Assume coefficient C (in the discharge equation) as 2.16, compute

i) Discharge per meter length of spillway
ii) Pre-jump velocity at the toe
iii) Pre-jump Froude number of the flow
iv) Conjugate depth required for hydraulic jump

If the actual tail water depth is 5.2 m, what type of energy dissipation arrangement would you provide?
Discharge Coefficient for Design Head

Ratio of Head on Crest to Design Head ($H/H_0$)

Effect of Tail Water on Discharge Coefficients
2018-2019
M.Tech (IIIrd Semester) Examination
Environmental Engineering
CE-721
WATER TREATMENT PLANT DESIGN AND OPERATIONS

Maximum Marks: 60
Duration: Two Hours

Instructions:
i. Attempt / Answer all the questions.
ii. Assume suitable data, in case if not given.
iii. Notations have their usual meanings.
iv. Answer questions in their order of sequence

Q.No. 1a List any four chemicals and their treatment flow sheet that comes under the candidate list of emerging contaminants for drinking water standards in the developed nations like USA, Japan etc. and discuss their health and environmental risk when these are present.

Q. No. 1b Suppose the state appoints you as one of the members in an advisory council for the National Drinking Water Standards Policy in India, what are the factors that you may consider while debating the water quality standards for the next 10 years? Support your answer with reasonable rationale.

Q.No. 1c What are the factors that influences the selection of water treatment facility for any town? Discuss the importance of city terrain in the planning of WTP.

Q.No. 1c' Discuss the purpose of each component as shown in the diagram given below and sole objective of the entire scheme:
Q.No.2a Using the data below, design an intake structure and pumping station to lift the water from the river bed to feed the reservoir for storage to a water treatment plant for a city having population of 1 million (as per 2011 census). Discharge = 46.25 MGD
IL of the River Bed = 100.00 above MSL
Distance in between the river and the reservoir = 450 m
Number of the bends = 05

Q.No.2b Using the above data, design a reservoir for storage and settling purpose of the suspended solids that may present in the river water before conveying the water to a treatment facility which shall be located 40 kms from the reservoir.

Q.No.3 A water treatment plant is to be designed to meet out the Indian drinking water standards that has been sourced from the river as above. Using the data in the above questions, carry out a detailed design of your facility essentially comprising the following units:

a. Screen Chamber
b. Division Box
c. Coagulation & Flocculation
d. Sedimentation Tank
e. Filtration Tank
f. Reservoir (before supply)

Or

Q.No.3' Using the same data, design water treatment facility based on any advance method of treatment like reverse osmosis for much improved water quality. Also show neat sketch of the scheme that you are proposing.

Q.No.4a Design a chlorine contact tank for a flow of 46.25 MGD while showing complete dosing arrangements (diagram) and baffles in the tank as per the standard design practice.

Q.No.4b Discuss the various methods of sludge handling from the primary clarifiers at the water treatment facilities.
Answer all the questions.
Assume suitable data if missing.
Notations used have their usual meaning.

Q.No.                                Question                                                                                     M.M.
1(a) What are the different types of bored pile wall? Discuss any one in detail.                     07
1(b) With the help of neat diagrams, discuss the basic concept of design in ‘Retaining Walls with Relieving Shelves’ 08
2(a) With the help of neat sketch, describe the control yielding technique for reduction of lateral earth pressure. 07
2(b) Discuss the advantages and disadvantages of dynamic compaction.                                     08
If a structure adjacent to a site is in danger of being damaged by a peak particle velocity in excess of 2 cm/s in the ground, what is the minimum safe distance for heavy tamping? 08
3 Write short notes on any THREE of the following:                                                      15
   a) Flat dilatometer test
   b) Pressuremeter testing
   c) Advances in geotechnical testing and monitoring
   d) Piezocone test
   e) Osterberg cell
4(a) What are the possible hazards linked with underground construction and list the key points to be emphasised during training of underground construction employee.                  07
        OR
4(a’) Discuss in detail the special conditions of safety for underground drilling and blasting.          07
4(b) What is the geotechnical aspect of safety associated with dam foundation construction site.            08