Maximum Marks: 60
Credits: 04
Duration: Two Hours

Note: (i) Answer all the questions.
(ii) Assume suitable data, if not given.
(iii) Use of IS codes 456, 3370 and IRC loading charts are allowed.

Q1. Calculate the reinforcement in a continuous reinforced concrete beam of rectangular section to support a dead load of 10kN/m and a service live load of 15 kN/m over three simply supported spans of 8m each. The materials to be used are M-20 grade concrete mix and HYSD steel of grade Fe-415 for moderate exposure conditions. Use bending moment and shear force coefficients for the continuous beam given in IS-456.

OR

Q1'. Determine the design moments at support and in the mid span region, before and after redistribution of moments of 30%, for a beam AB of span L, carrying a uniformly distributed load, when (i) it is fixed at both ends A and B; (ii) it is fixed at end A and simply supported at B. Draw the bending moment diagrams in each case, and show the points of contra flexures and points of maximum bending moments.

Q2. Design the cylindrical wall of an Intz type water tank of 0.8 million litres capacity, supported on an elevated tower comprising of 8 columns. The base of the tank is 16 m above the ground level. Depth of foundation is 1.5 m below the ground level. Adopt M-25 grade concrete and Fe-500 grade TMT steel. The design of the tank should conform to the stresses specified in IS:3370 and IS:456.

OR

Q2'. Design the only long wall of a rectangular water tank of plan dimension 6m x 4m (inside) and of 2.5m high. The tank rests on firm ground. Use M-25 grade concrete and Fe-500 grade TMT steel. The design of the tank should conform to the stresses specified in IS:3370 and IS:456.

Q3. A slab culvert has to be constructed for a national highway of span 5m (clear) and clear roadway of 10 m between the kerbs. Sketch the outlines for I.R.C. Class AA tracked vehicle on the deck. Calculate the maximum B.M. and S.F. due to the above load. Use M-25 grade concrete and Fe-500 grade steel.

Contd...2.
Q4 (a) What is Prestressed concrete? Discuss the merits and demerits of prestressed concrete over conventional reinforced concrete. (06)

(b) A beam of 150 mm x 300 mm is prestressed by a force of 250 kN by steel cables located at an eccentricity of 60 mm as shown in Fig.1. Determine the loss of prestress due to creep of concrete for the following data:

\[ \sigma_{ck} = 45 \text{ N/mm}^2 \]
Cables = 6 Nos. -7 mmφ
Creep coefficient = 2
\[ E_s = 200 \text{ kN/mm}^2 \]
\[ E_c = 30190 \text{ N/mm}^2 \]

Q5. Calculate the main reinforcement in the waist slab of a staircase shown in Fig.2. The stairs are simply supported on beams provided at the first riser and at the edge of the upper landing. Assume a finish load of 0.8 kN/m² and a live load of 5.0 kN/m². Use M20 grade concrete and Fe415 grade steel. Assume mild exposure conditions. Take Tread T = 300 mm and Riser R=150 mm. (12)

OR

Q5'. A vertical stem T-shaped retaining wall of height 3 m above the ground level is to constructed for a highway. The top of the earth retained is surcharged at an angle of 10° with the horizontal. The angle of repose of earth is 29° and its density is 17kN/m³. The safe bearing pressure is 100 kN/m². The B.M. and S.F at the critical section is 47.3 kN/m and 35.5 kN respectively. Design the section at bottom of the cantilever and proportioned the various other components. Check the safety of the section in shear also. Use M-25 grade concrete and Fe- 500 grade TMT bars. (12)
FIGURES

Note: All dimensions are in mm

Fig.1

Fig.2

Note: All dimensions are in mm
2016-2017
B.Arch. / B.Tech. (End Semester) Examination
(Architecture / Civil Engineering)

Design of Concrete Structures-II (CE-411)
(Graduating Course)

Maximum Marks: 60 Credits: 04 Duration: Two Hours

Note: (i) Answer all the questions.
(ii) Assume suitable data, if not given.
(iii) Use of IS codes 456, 3370 and IRC loading charts are allowed.

Q1. Calculate the reinforcement in a three span continuous beam of a typical interior idealized plane frame of a building. The frames are spaced 5.5m apart and in the typical floor 140mm thick continuous slab is cast monolithically with beams. The thickness of floor finish is 40mm. The beam has three equal spans of length 6.1m. The floor is to support imposed load of 5 KN/m² at the service state. The unit weight of the finishing material is 20KN/m³. The materials to be used are M-20 grade concrete mix and HYSD steel of grade Fe-415 for moderate exposure conditions. Use bending moment and shear force coefficients for the continuous beam given in IS-456.

OR

Q1'. Obtain the maximum elastic moment diagram (BM envelop) for ultimate limit state before redistribution of moments, and design moment envelop after 30% redistribution of moments for a two span continuous beam ABC, 8m long, freely supported at A and C, and continuous over the central support B, 4m from A. The beam carries dead load (inclusive of self weight) of 20 kN/m and a uniformly distributed live load of 28 kN/m.

Q2. Design the top ring beam and cylindrical wall of an Intz type water tank of 1 million litres capacity, supported on an elevated tower comprising of 8 columns. The base of the tank is 16 m above the ground level. Depth of foundation is 1.5 m below the ground level. Adopt M-25 grade concrete and Fe-500 grade TMT steel. The design of the tank should conform to the stresses specified in IS:3370 and IS:456.

OR

Q2'. Design the long wall of a rectangular water tank of capacity 70,000 litres. The tank rests on firm ground. Use M-25 grade concrete and Fe-500 TMT bars. The design of the tank should conform to the stresses specified in IS:3370 and IS:456.
Q3. Design a slab culvert (section and steel reinforcement) for a clear span of 5m having a clear roadway of 10 m between kerbs for I.R.C. Class AA single wheeled vehicle. Sketch the outlines for IRC Class AA tracked vehicle on the deck. Use M-20 grade concrete and Fe-415 grade steel. (12)

Q4(a) Explain why high strength concrete and high tensile steel are used for prestressed concrete construction. (06)

Q4(b) In prestressed concrete beam of cross-section 200mm x 300mm and span 6m, an initial prestressing force of 400KN is applied at constant eccentricity of 50mm by tendons of area 400mm². Assuming Es = 2 x 10⁵ N/mm²; Ec = 0.333 x10⁵ N/mm²; anchor slip = 1.5mm; creep coefficient in concrete Cc = 2.0; shrinkage coefficient of concrete = 0.0002 and creep in steel = 3.0%. Find the total percentage loss of prestress in the tendons. (06)

Q5. Calculate the reinforcement in a waist slab type of a dog-legged staircase for an office building for the following data: (12)

Height between the floor = 3.2 m
Tread T = 270 mm
Riser R = 160 mm
Width of flight = landing width = 1.25 m
Live load = 5.0 kN/m²
Finished load = 0.6 kN/m²

Assume the stairs to be supported on 230 mm thick masonry walls at the outer edges of the landing, parallel to the risers. Use M20 grade concrete and Fe415 grade steel.

OR

Q5'. Design the vertical stem of a T-shaped retaining wall for a height of 4 m above the ground level. The top of the earth retained is surcharged at an angle of 10° with the horizontal. The angle of repose of earth is 30° and its density is 17kN/m³. The safe bearing pressure is 150 kN/m². Use M-20 grade concrete and Fe-500 grade TMT bars. (12)
1(a). Discuss the active state and the passive state of retaining wall in terms of lateral earth pressure?

1(b). A retaining wall retaining two layers of cohesionless soils, first layer is dry, and second layer is fully submerged in water. The backfill of the wall has the following data:

1st Layer = 3.0 m thick, $\phi = 30^\circ$ and $\gamma = 16$kN/m$^3$

2nd Layer = 6.0 m thick, $\phi = 20^\circ$ and $\gamma_{sat} = 22$kN/m$^3$

Determine total lateral earth pressure and its point of application from the top of the wall if the retaining wall moves away from the backfill.

OR

1'(a) What are the different types of earth retaining structures? Explain the method for safe depth of embedment of anchored sheet pile wall.

1'(b) A cantilever sheet pile wall supports soil mass up to a height of 7.0 m. The unit weight of the soil, $\gamma = 20$kN/m$^3$, and angle of internal friction, $\phi = 25^\circ$ and unit cohesion, $c = 0$.

Determine the critical and safe depth of embedment required theoretically, neglecting friction on the surface of the pile.

2(a). With the help of a neat sketch, describe “Swedish Circle Method” for determining the stability of a finite slope.

2(b). Compute the safe height for an embankment rising at an angle of 60° to the horizontal, and to be made with a soil having unit weight ($\gamma$) = 20 kN/m$^3$, cohesion ($c$) = 20 kN/m$^2$, angle of internal friction ($\phi$) = 15°. Factor of safety may be considered as 2.5. Make use of Taylor’s method.

3(a). Write a short note on plate load test used for determining bearing capacity of soil.

3(b). A square footing located at a depth of 1.8 m below the ground surface in cohesionless soil carries a column load of 1480 kN. The soil is submerged having an effective unit weight of 10.5 kN/m$^3$ and an angle of shearing resistance of 30°. Find the size of the footing for a factor of safety of three. Use Terzaghi’s theory of local shear failure.
4(a). With the help of a neat sketch, briefly describe the composite piles.

4(b). A precast concrete pile was driven in sand, using a 2.5 tonne hammer having a free fall of 1.5 m. The penetration of the pile in the last blow of the hammer was noted as 8 mm. The efficiency of hammer was 0.80. Determine the ultimate load carrying capacity of the pile in kN using Engineering News Formula.

OR

4'(a) Write a short note on pile load tests carried out as per IS code (IS:2911-1).

4'(b) A 10 m long 400 mm diameter concrete pile is driven in a uniform deposit of sand ($\phi = 40^\circ$). The water table is very much down and is not likely to rise in future. The average dry unit weight of sand is 18 kN/m$^3$. Calculate the safe load carrying capacity of the pile with a factor of safety of 2.5. Assume the critical length of the pile as 20 times the pile diameter.

5(a). Describe any two of the following terms in connection with the design of machine foundations:

(i) Vibration isolation technique  
(ii) Over and under damped of free vibrations

(iii) Damping factor

5(b). Briefly describe the Barken's method for determining the natural frequency of a vibrating system. A 2.5 tone machine is resting on a R.C.C. block having base area of 9.5 m$^2$ and weight of 30 tones. The coefficient of uniform elastic compression of soil at site ($C_u$) is $4 \times 10^4$ kN/m$^3$. Determine the natural frequency of machine foundation system if the soil mass participating in vibration is 25% of the total weight of machine and foundation block.
Table: Terzaghi's Bearing Capacity Factors

<table>
<thead>
<tr>
<th>$\phi'$</th>
<th>General Shear</th>
<th>Local Shear</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$N_c$</td>
<td>$N_q$</td>
</tr>
<tr>
<td>0</td>
<td>5.7</td>
<td>1.0</td>
</tr>
<tr>
<td>5</td>
<td>7.3</td>
<td>1.6</td>
</tr>
<tr>
<td>1</td>
<td>9.6</td>
<td>2.7</td>
</tr>
<tr>
<td>1</td>
<td>12.4</td>
<td>4.4</td>
</tr>
<tr>
<td>2</td>
<td>17.4</td>
<td>7.4</td>
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<tr>
<td>2</td>
<td>25.2</td>
<td>12.7</td>
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<td>3</td>
<td>37.2</td>
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<td>57.4</td>
<td>41.4</td>
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<tr>
<td>4</td>
<td>95.4</td>
<td>81.3</td>
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<tr>
<td>4</td>
<td>172</td>
<td>173.1</td>
</tr>
<tr>
<td>5</td>
<td>347</td>
<td>415</td>
</tr>
</tbody>
</table>

Table: Values of K and $\delta$

<table>
<thead>
<tr>
<th>Pile Material</th>
<th>$\Delta$</th>
<th>Value of K</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Loose Sand</td>
</tr>
<tr>
<td>Steel</td>
<td>20</td>
<td>0.5</td>
</tr>
<tr>
<td>Concrete</td>
<td>0.75$\phi$</td>
<td>1.0</td>
</tr>
<tr>
<td>Timber</td>
<td>0.67$\phi$</td>
<td>1.5</td>
</tr>
</tbody>
</table>

Table: Taylor's Stability Numbers for $c - \phi$ soils

<table>
<thead>
<tr>
<th>$\phi_m$</th>
<th>$i$</th>
<th>$0^\circ$</th>
<th>$5^\circ$</th>
<th>$10^\circ$</th>
<th>$15^\circ$</th>
<th>$20^\circ$</th>
<th>$25^\circ$</th>
</tr>
</thead>
<tbody>
<tr>
<td>90$^\circ$</td>
<td>0.261</td>
<td>0.239</td>
<td>0.218</td>
<td>0.199</td>
<td>0.182</td>
<td>0.166</td>
<td></td>
</tr>
<tr>
<td>75$^\circ$</td>
<td>0.219</td>
<td>0.195</td>
<td>0.173</td>
<td>0.152</td>
<td>0.134</td>
<td>0.117</td>
<td></td>
</tr>
<tr>
<td>60$^\circ$</td>
<td>0.191</td>
<td>0.162</td>
<td>0.138</td>
<td>0.116</td>
<td>0.097</td>
<td>0.079</td>
<td></td>
</tr>
<tr>
<td>45$^\circ$</td>
<td>(0.170)</td>
<td>0.136</td>
<td>0.108</td>
<td>0.083</td>
<td>0.062</td>
<td>0.044</td>
<td></td>
</tr>
<tr>
<td>30$^\circ$</td>
<td>(0.156)</td>
<td>(0.110)</td>
<td>0.075</td>
<td>0.046</td>
<td>0.025</td>
<td>0.009</td>
<td></td>
</tr>
<tr>
<td>15$^\circ$</td>
<td>(0.145)</td>
<td>(0.068)</td>
<td>0.070</td>
<td>(0.023)</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>
Answer all the questions.
Assume suitable data if missing.
Notations used have their usual meaning.

Q.No. Question

Q1(a) What is Secondary Hydration? Explain it with the help of equation. [05]
(b) Compare graphically the development of strength of Pure Compounds of cements with age. [05]
(c) List the factors on which the maximum size of aggregate depends for concrete. [05]

OR

1' With the help of a neat sketch discuss the various stages required for the manufacture of Portland Cement. [15]

2(a) Discuss the steps required to reduce the Alkali Aggregate Reaction. [08]
2(b) Discuss the main factors affecting the Shrinkage of concrete [07]

OR

2' What do you understand by workability of concrete? Discuss in detail factors affecting the workability of concrete. [15]

3 What is meant by Durability of Concrete and what are the factors that affect it? [15]

4 What are the various destructive tests for assessing the quality of fresh and hardened concrete? Discuss at least two of them in details. [15]

OR

4' What are the various Non-Destructive Tests for assessing the quality of hardened concrete? Explain briefly at least one of them. [15]

5 What is meant by self-compacting concrete? What are the advantages of this type of concrete? [15]
B.TECH. (AUTUMN SEMESTER) EXAMINATION
(CIVIL ENGINEERING)
TRAFFIC ENGINEERING
(CE-423)

Maximum Marks: 60 Credits: 04 Duration: Two Hours

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

1(a). Briefly describe the guidelines for zoning of a given traffic area.

OR

1'(a). A zone has 250 household with car and 250 household without car and the average trip generation rates for each groups is respectively 5.0 and 3.0 trips per day. Assuming that in the future, all household will have a car, find the growth factor and future trips generation from that zone, assuming that the population will increase 1.15 times and income remains constant.

1(b). As a transport planner and traffic engineer, suggest a proposal plan in 6 to 10 steps for jam-free traffic at Dodhpur Chauraha. Steps should have written in progressive manner.

2(a). Briefly describe the PIEV theory related to general reaction to the traffic situations.

2(b). With the help of a neat sketch, explain the flow – density curve of traffic.

OR

2'(a). List the various applications of "Origin and Destination" survey.

2'(b). The consolidated data collected from speed and delay studies by moving vehicle method on a stretch of urban road of length 3.5 km are given below.

<table>
<thead>
<tr>
<th>Trip No.</th>
<th>Direction of trip</th>
<th>Journey time</th>
<th>Total stopped delay</th>
<th>No. of vehicles</th>
<th>No. of vehicles from opposite direction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Min. Sec.</td>
<td>Min. Sec.</td>
<td>Overtaking</td>
<td>Overtaken</td>
</tr>
<tr>
<td>1</td>
<td>N - S</td>
<td>6 30</td>
<td>1 40</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>S - N</td>
<td>7 12</td>
<td>1 50</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>N - S</td>
<td>6 50</td>
<td>1 30</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>S - N</td>
<td>7 40</td>
<td>2 00</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>N - S</td>
<td>6 10</td>
<td>1 10</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>S - N</td>
<td>7 54</td>
<td>2 22</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>N - S</td>
<td>6 28</td>
<td>1 40</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>S - N</td>
<td>7 30</td>
<td>1 40</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

Determine the average values of volume, journey speed and running speed of the traffic stream along North – South direction only.
3(a). List the various advantages of grade separated intersections.

3(b). Traffic flow in an urban area at an intersection of two highways during a year is as follows:

<table>
<thead>
<tr>
<th>Approach</th>
<th>Left Turning</th>
<th>Straight Ahead</th>
<th>Right Turning</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cars</td>
<td>Buses</td>
<td>Cars</td>
</tr>
<tr>
<td>North</td>
<td>220</td>
<td>50</td>
<td>260</td>
</tr>
<tr>
<td>East</td>
<td>190</td>
<td>70</td>
<td>240</td>
</tr>
<tr>
<td>South</td>
<td>240</td>
<td>80</td>
<td>160</td>
</tr>
<tr>
<td>West</td>
<td>230</td>
<td>60</td>
<td>180</td>
</tr>
</tbody>
</table>

(i) Convert all the traffic of different directions in terms of Passenger Car Unit (PCU)
(ii) Write the converted traffic values on Figure 1(draw on your answer sheet).
(iii) Also find out the number of vehicles in terms of PCU entering and leaving the intersecting roads and write these on Figure 2(draw on your answer sheet).

4(a). Classify the road markings and list their benefits.

4(b). Draw the traffic signs for any four of the given commands. Colouring is not required.
   (i) Vehicles prohibited in one direction
   (ii) Compulsory ahead or turn right
   (iii) Right reverse band
   (iv) Parking both side
   (v) Vehicle width limit
   (vi) Overtaking prohibited
Answer all the questions.
Assume suitable data if missing.
Notations used have their usual meaning.

Q.No.                  Question                                      M.M.
1(a)                   Discuss the importance of uplift force in the design of gravity dams. [05]
1(b)                   Derive an expression for the principal and shear stresses developed in the body of a gravity dam. [10]

OR

1'(b)                  Design zone I & II of a 58m high concrete gravity dam by the method of zoning with the help of the given data:
                       Fetch of reservoir =15 km
                       Wind speed = 88kmph
                       Unit weight of dam material = 24 kN/m³
                       Uplift pressure coefficient = 0.75
                       Coefficient of friction = 0.65
                       [10]

2(a)                   Differentiate between low and a high gravity dams. [05]
2(b)                   Calculate the forces and moments due to horizontal earth quake acceleration ($\alpha = 0.08$) for the dam section shown in Fig 1. [10]

OR

2'(b)                  Derive the relations for the base width of an elementary profile of a gravity dam. [10]
3(a)                   Design a 100 m high constant angle arch dam by thin cylinder theory for a valley 50 m wide at the base and 250 m wide at a height of 100 m. The permissible compressive stress of concrete 500 t/m². [10]
3(b)                   Briefly explain thick cylinder theory for design of arch dam [05]

OR

3'(b)                  Write short notes on classification of buttress dam. [05]
4(a)                   Discuss the importance of relief wells in case of earthen embankment. [05]
4(b)                   Describe causes of seepage failure of an earthen dam. [05]
4(c)                   What is the difference between rolled fill and hydraulic fill type of embankment construction. [05]
4'(e) Draw the neat sketch of a zoned embankment resting on a deep pervious strata and show its components.

Fig. 1

[Note: All dimensions are in meter]
2016-17
B.TECH. (AUTUMN SEMESTER) EXAMINATION
CIVILENGINEERING
STRUCTURAL ANALYSIS II
CE 430

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. 1

Question
Analyze the frame shown in Fig. 1 using Kani’s method. EI is same for all members.

M.M. [12]

Fig. 1

OR

1' Analyze the frame shown in Fig. 2 using Kani’s method. EI is same for all members.

Fig. 2

Contd....
2. Use Stiffness method to analyse the frame shown in Fig. 3. Flexural rigidity, EI, of the members is constant throughout.

3. Use flexibility method to analyse the beam shown in Fig. 4. Flexural rigidity, EI, of the members is constant throughout.

4 (a) A horizontal beam ABC, simply supported at A and B with span AB of 20m is having an overhanging portion BC of length 8m. Draw IL - Diagrams for bending moment for the section D at 4m to the left of B. Calculate the maximum positive and negative B.M. at D due to a uniformly distributed load of 2kN/m intensity and 4m long crossing the beam from one end to another.

4 (b) A beam ABC simply supported at A, B and C and having a hinge at D, 5m from A, has equal spans AB and BC of 10m each. Calculate the values after drawing and using their respective IL - Diagrams, of the reactions at A, B and C, due to a uniformly distributed load of 1kN/m intensity and of 4m length, crossing the beam from one end to another.

OR

Contd... 3.
4'. For the continuous beam with internal hinges at C and D as shown in Fig. 5, draw the influence line diagram (I.L.D.) for reactions at the supports A and B; shear force and bending moment at the section G.

![Diagram of a continuous beam with internal hinges at C and D, showing sections A, B, C, D, E, and F with distances 6m, 6m, 4m, 4m, 24m, 8m, and 12m respectively.](image)

**Fig. 5**

5. Calculate maximum horizontal thrust and bending moment at a section 6 m from the left hand hinge support of a three hinged parabolic arch whose span is 16 m with a central rise of 4 m, due to a 80 kN point load rolling over the arch from left to right.  

OR

5'. Draw IL - diagram for the axial forces in the members 1 and 2 of the truss as shown in Fig.6.

![Diagram of a truss with members 1 and 2, showing a load at 6m and 10m = 40 m.](image)

**Fig. 6**
Answer all the questions.
Assume suitable data if missing.
Notations used have their usual meaning.

1(a) How is the local magnitude of an earthquake related to the intensity of an earthquake? What is the basic design philosophy of seismic design of structures? Discuss briefly the need of seismic zoning.

1(b) An earthquake causes an average of 2.6m strike-slip displacement over a 75km long, 22km deep portion of transformed fault. Assuming the average rupture strength along the fault as 180kPa. Estimate the seismic moment and moment magnitude of the earthquake.

1(e) Determine the free vibration response of a single degree of freedom system at time \( t=0.20 \text{sec} \) for the following data: natural circular frequency \( \omega=12\text{rad/s} \), Damping ratio \( \xi=0.15 \), initial velocity \( x(0)=10\text{cm/s} \) and initial displacement \( x(0)=5\text{cm} \).

OR

1'(a) What is meant by focus and epicentre of an earthquake? Define seismographs and explain its working principle.

1'(b) In an experiment on a certain structure modelled as a single degree freedom system, the amplitude of free vibration decreased from 10mm to 4mm. If the logarithmic decrement was 0.1018 and undamped natural frequency is 40rad/sec, determine the damping ratio, damped period and number of cycles completed.
1'(c) A damped single degree of freedom system has the following properties:

Mass (m) = 2kg; Stiffness (K) = 15,000N/m and coefficient of damping (C) = 45N/m/s. Determine the natural circular frequency, damping factor, and damped frequency of the system. Write the equation of free response for determine the time history response of the system.

2. Answer any Three of the followings:

(i) In what way is the earthquake resistance of a structure affected by non-symmetry and elongated shape of building?

(ii) Give the measures and provisions as per IS1893:2002 to make a building resistant in earthquake prone regions.

(iii) Explain the following:
Response spectrum Factor; Provisions for torsion; story drift and soft storey.

(iv) Discuss inexpensive strengthening measures of partially or non-engineered low-cost housing.

(v) Give a list for do's and don'ts to mitigate the cyclone housing disaster in cycle prone area.

(vi) Explain the procedure to find out wind force on a warren truss bridge.

3 (a) Give a short account of hydro-meteorological disasters with special reference to India.

3 (b) Enumerate methods and factors of quantifying landslide hazards.

OR

3 (b') Enumerate different geotechnical methods of slope protection and show them on a neat diagram.

4 (a) Give a brief account of disaster management organisation in India.

4 (b) Write short notes on any two of the followings:

(i) Flood Walls (ii) Flood Levees (iii) Flood bypass, (iv) Flood Discharge Estimate
2016-17  
B.TECH.(AUTUMN SEMESTER) EXAMINATION  
(CIVIL ENGINEERING)  
ELEMENTS OF EARTHQUAKE AND WIND ENGINEERING  
(CE-445N)  

Maximum Marks: 60  
Duration: Two Hours  

Answer all the questions.  
Assume suitable data, if missing  
Notations used have their usual meanings.  
Use of IS 1893 & IS 875 are allowed  

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<th>Question</th>
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<td>1</td>
<td>What is the difference between (any five)</td>
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<tr>
<td>i.</td>
<td>Probabilistic and Deterministic Seismic Hazard Analysis</td>
<td>[03]</td>
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<td>ii.</td>
<td>Magnitude and Intensity of Earthquake</td>
<td>[03]</td>
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<td>iii.</td>
<td>P wave shadow zone and S wave shadow zone</td>
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<td>iv.</td>
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<td>v.</td>
<td>Surface wave Magnitude and Body wave Magnitude of Earthquake</td>
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<td>vi.</td>
<td>Fourier Spectra and Power Spectra</td>
<td>[03]</td>
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</table>

2(a) Plot the response of a single degree undamped system subjected to step pulse | [07] |

2(b) Find the natural frequencies and mode shapes of a two-story single bay shear building modeled as two DOF system with properties as given below.  
   Stiffness of columns of ground floor = 2k  
   Stiffness of columns of first floor = k  
   First Floor mass = 2m  
   Second floor mass = m  
   Assume columns to be fixed at base | [08] |

3(a) Define bands with neat sketches. At what levels in a masonry building would you provide them? Give justifications for each of them. | [08] |

3(b) Discuss the major causes of failure of the RC structures under past Earthquakes. | [07] |

4(a) Describe the various Earthquake resistant features that can be introduced in a masonry building to make it Earthquake resistant. | [05] |

4(b) The plan and elevation of a three storey RCC hospital building is shown in | [10] |
The building is located in seismic zone V. The type of soil encountered is medium stiff and it is proposed to design the building with a special moment resisting frame. The intensity of dead load is 15.0 kN/m² and floors are to cater to an imposed load 4.0 kN/m². Determine the seismic forces at different floor levels.

OR

4'(a) Sketch the ductile detailing of reinforcement in Beam-column Joint as per IS 13920.

4'(b) A multi-storeyed building shown in figure below having 20m x 30m plan dimensions and an overall height of 30m is to be designed at Agra in developed out-skirt area with scattered buildings of its height. Determine the design wind pressures acting on the building and draw the pressure diagram.
2015-16
B.TECH. (WINTER SEMESTER) EXAMINATION
CIVIL ENGINEERING
ENGINEERING HYDRAULICS-II
CE-414

Maximum Marks: 60
Credits: 04
Duration: Three Hours

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

Q.No. | Question | M.M.
---|---|---
1(a) | Classify the following open channel flow situations:
   
   (i) Flow in main irrigation canal,

   (ii) Breaking of a dam, and

   (iii) Flow over a side weir. | [3]

1(b) | Show the variation of \( y_1 \) and \( y_2 \) with hump height in subcritical and supercritical flows with neat sketches. | [4]

1(c) | Calculate the bottom width of the channel required to carry a discharge of 15 m\(^3\)/s at a critical depth of 1.2 m, if the trapezoidal channel section is 1.5 m deep with a side slope 1.5H:1V. | [8]

OR

1′(a) | If \( y_1 \) and \( y_2 \) are the alternate depths in a rectangular channel show that

\[
y_c^3 = \frac{2y_1^2 y_2^2}{(y_1 + y_2)}
\]

1′(b) | A 5.0 m wide rectangular channel carries a discharge of 6.4 m\(^3\)/s at a depth of 0.8 m. At a certain section there is a smooth hump of height 0.20m in the bed. What is the water surface elevation over the hump? | [10]

2(a) | Show that the normal depth in a triangular channel of side slopes \( m \) horizontal: 1 vertical, is given by

\[
y_o = 1.1892 \left[ \frac{Q n}{\sqrt{S_o}} \right]^{3/8} \left[ \frac{m^2 + 1}{m^2} \right]^{1/8}
\]

2(b) | Show that maximum discharge in a circular channel occurs when \( \frac{y}{D} = 0.938 \) where \( y \) = depth of flow and \( D \) = diameter of the circular channel. | [09]

Contd.....2.
3(a) A sluice gate discharges 2 m$^3$/s into a wide horizontal rectangular channel. The depth at the vena contracta is 0.15 m. The tail water depth is 1.85 m. Assuming the channel to have a Manning's $n = 0.02$, determine the location of the hydraulic jump. [10]

3(b) Show that the GVF profile in a frictionless rectangular channel is given by

\[ X = \frac{y}{S_o} \left[ 1 + \frac{1}{2} \left( \frac{y_c}{y} \right)^3 \right] + \text{const.} \] [05]

OR

3'(a) Classify the hydraulic jump on the basis of initial Froude number, Fr$_i$. [04]

3'(b) A rectangular channel carrying a supercritical stream is to be provided with a hydraulic jump type energy dissipater. If it is desired to have an energy loss of 5 m in the jump when the inlet Froude number is 8.5, determine the sequent depths. [05]

3'(c) Derive the basic differential equation of gradually varied flow. Also mention the assumptions made. [06]

4(a) Classify waves on the basis of motivating force and mass transport. [3]

4(b) What are the advantages and disadvantages of distorted models? [4]

4(c) A wide tidal river has a low water velocity of 1.5 m/s and a depth of flow of 2.5 m. A tide in the sea causes a bore to travel upstream. If the height of the bore is 0.9 m, estimate the speed of the bore and the velocity of flow after its passage. [8]

OR

4'(c) A spillway 200 m long and 6 m high without piers discharges 560 m$^3$/s under a head of 1.2 m. The necessary tail water to form the hydraulic jump on the apron is to be determined by model test. The laboratory channel is 0.4 m wide and 0.5 m deep with a water supply of 60 litres per second. Design a suitable model for the spillway. [8]