### Q.No. Question M.M.

1. A continuous beam of two spans is fixed at the end supports and continuous over the centre support.  
   Distance between the centre of supports = 8 m  
   The beams support a reinforced concrete slab 150 mm thick with live load on floor of 2 kN/m².  
   Spacing of continuous beams = 4 m  
   Characteristic strength of concrete = 20 N/mm²  
   Characteristic strength of steel = 500 N/mm²  
   Design the continuous beam for 20 percent redistribution of moments using limit state method.  

   **OR**

   **1′(a)** Write short notes on  
   (a) Isolating devices  
   (b) Properties of construction materials for earthquake-resistance

   **1′(b)** The plan and elevation of a three storey RCC school building is shown in Fig.1. The building is located in the 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 10kN/m² and the floors are to cater to an imposed load of 3 kN/m². Determine the design seismic loads on the structure by static analysis.

   **contd... 2.**
2  Design the short wall of a RC tank 8.0 x 4.0 x 4.0 m deep resting on ground. Adopt M 25 grade concrete and Fe 500 steel bars. The design of tank should conform to the stresses specified in IS 3370: 2009 and IS 456: 2000.

OR

2' Design a 'waist slab' type dog-legged staircase for an office building, given the following data:

Height between floor = 3.2 m;
Riser = 160 mm, tread = 300 mm;
Width of flight = landing width = 1.25 m
Live load = 7.0 kN/m² and finishes load = 0.6 kN/m²
Assume the landing to be supported only on two edges perpendicular to the risers. Use M 20 concrete and Fe 500 steel. Assume mild exposure conditions.

3  A reinforced concrete simply supported slab is required for the deck of road bridge having the data given below: Width of carriageway = 7.5 m; kerbs 600 mm wide; clear span 5 m; Type of loading: IRC class AA; Materials: M20 grade concrete and Fe 500 steel. Calculate the bending moments and check for shear for dead and live loads.

4(a) List various types of time dependent losses in a prestressed concrete member. Discuss any two of them briefly.

4(b) In a prestressed concrete beam of cross section 200 mm x 300 mm and span 6.0 m, an initial prestressing force of 400 kN is applied at an eccentricity of 70 mm by tendons of area 400 mm². Assuming $E_s = 2 \times 10^5 N/mm^2$, $E_c = 0.333 \times 10^5 N/mm^2$, creep coefficient in concrete $\theta = 1.0$, shrinkage of concrete = 0.0002 and creep loss in steel = 3.0%. Find the total percentage loss of stress in the tendons.

![Plan](Image)

![Elevation](Image)

Fig.1
1(a) What are the assumptions of Rankine's theory of earth pressure? Explain active pressure, [07] pressure at rest and critical height of unsupported vertical cut.

1(b) A 7.0m high retaining wall has vertical and smooth back side and retains a cohesionless backfill [08] with horizontal surface. The retained soil has unit weight of 18 kN/m², angle of shearing resistance of 30° and uniformly distributed surcharge intensity of 15 kN/m². Determine the magnitude, direction and position of active lateral earth pressure against the retaining wall.

(OR)

1'(a) Explain the Resal and Bell theory of earth pressure on retaining wall. An excavation is made for [07] a building foundation in a cohesive soil having undrained cohesion, c = 100 kN/m², angle of shearing resistance, $\phi = 0^\circ$ and unit weight, $\gamma = 18$ kN/m³. Determine the depth of tensile crack.

1'(b) The backside of 10.0m high retaining wall is inclined at an angle of 10° with vertical. The [08] backfill is a cohesionless soil having unit weight of 18 kN/m³ and angle of internal friction of 30°. The backfill is inclined at an angle of 10° with the horizontal and the angle of wall friction is 20°. Compute the maximum active thrust on the wall and show the position of critical slip plane, using Rebmann's graphical construction method.

2(a) Explain the friction circle method of stability analysis of slopes. [07]

2(b) A slope is to be made of granular soil having $\gamma_{sat} = 21$ kN/m³, $\phi = 34^\circ$. If a FOS =1.5 is needed [08] against slope failure, determine the safe angle of the slope (a) when the slope is dry (b) if seepage occurs parallel to the surface of the slope (c) if seepage occurs parallel to the slope with water table at a depth of 2 m, what is FOS available on a slip plane parallel to the ground surface at a depth of 5 m? Assume slope angle as 28°.

3(a) Describe any three of the following terms: [06]
   (i) Safe bearing capacity
   (ii) Local shear failure
   (iii) N-value of SPT
   (iv) Total and Differential settlement of footing
   (v) Under damped case of free vibration

contd...
3(b) Using Terzaghi’s theory, determine the gross and net safe bearing capacity of 1.0 m wide strip footing and 1.0 m square footing resting at 1.0 m depth on sand having the following properties:
Unit weight of soil, $\gamma = 18 \text{ kN/m}^3$, cohesion, $c = 0$, angle of shearing resistance, $\phi = 36^\circ$ and bearing capacity factors, $N_c = 17.5$, $N_q = 7.5$ and $N_R = 5$. Assume the factor of safety as 3.0 and the water table is at great depth.

(OR)

3(b') A vibrating system of machine foundation consisting of a mass of 70 N and a spring stiffness of 4.5 kN/m is viscously damped such that the ratio of any two successive amplitudes is 1.0 to 0.96. Determine:

(i) Natural frequency of undamped and damped systems
(ii) Logarithmic decrement
(iii) Damping factor

4(a) State the criterion for selecting a pile foundation? Discuss the various methods of boring.

4(b) A group of nine piles, 8 m long is used as the foundation for a column. The piles are 30 cm in diameter with spacing of 900 mm c/c. The subsoil consists of clay with unconfined compressive strength of 180 kN/m$^2$. Estimate the safe load and check whether failure would occur by a single pile failure, or as a block. Take $\alpha = 0.65$ and F.O.S = 3.0.

(OR)

4(b') Determine the safe load that can be carried by a pile having a gross weight of 15 kN, using Modified Hiley’s formula.

Given:

i. Weight of Hammer = 20 kN
ii. Effective fall of hammer = 0.68 m
iii. Average penetration under the last five blows = 10 mm
iv. Length of the pile = 22 m
v. Diameter of the pile = 300 mm
vi. Coefficient of restitution = 0.55
2018-19
B.E (AUTUMN SEMESTER) EXAMINATION
CIVIL ENGINEERING
IRRIGATION ENGINEERING (ECE-415)

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                                                                 | M.M. |
------|--------------------------------------------------------------------------|------|
1(a)  | Why irrigation is essential? List out any four primitive methods of irrigation. Briefly describe any one of them with aid of neat sketch. | 7    |
1(b)  | What are the ill effects of irrigation?                                  | 3    |
1(c)  | Why silt exclusion from canals is essential? Describe Vortex tube type silt extractor with aid of neat sketch. | 5    |

OR

1'(a) | List out various methods of Irrigation used in Northern India. Describe basin and furrow methods in detail. | 8    |
1'(b) | What are canal outlets? Describe pipe outlet with aid of neat sketch.   | 7    |
2(a)  | Differentiate among the following:                                       | 5    |
(i)   | Duty and delta                                                           |      |
(ii)  | Base Period and crop period                                              |      |
(iii) | Temporary wilting and permanent wilting                                  |      |
(iv)  | Water use efficiency and water storage efficiency                        |      |
(v)   | Irrigation requirement and field irrigation requirement                   |      |
2(b)  | What are three crop seasons in India? Name three crops for each season which are being sown in Northern India. | 4    |
2(c)  | How crops are classified based on agriculture?                           | 6    |

OR

2'(c) | What is canal outlet factor? Develop relationship between duty and delta. | 6    |
3(a)  | Differentiate among:                                                    | 4    |

contd...
(i) Silt factor and silt charge
(ii) Lacey’s and Kennedy’s method of earthen canal design
(iii) Initial regime and permanent regime
(iv) Dead man and Pustha

What is standard silt? Design a lined irrigation canal section to carry a discharge of 34 m³/s. The mean diameter of the soil particles is 0.464 mm. Take side slope 1.25 H: 1V and with zero width. The rugosity coefficient N may be taken as 0.018.

3(c) Draw the sketch of canal section in partial filling and partial cutting.

OR

3'(c) Draw the neat sketch of a canal networking system and properly label it.

4(a) Differentiate between Bligh’s and Khosla’s theory for permeable floor design.

4(b) Explain the function of the following:
   (i) Marginal bund
   (ii) Divide wall
   (iii) Cross regulator
   (iv) Ram Dhara

4(c) Using following data, design the crest of Sarda type fall.
   Full supply discharge \( Q \) = 12 m³/s
   FSL \( \text{us/ds} \) = 218.3m/216.8m
   FSD \( \text{us/ds} \) = 1.7m/1.7m
   Bed width \( \text{..} \) = 25m/25m
   Bed Level \( \text{..} \) = 216.5m/215.0m
   Drop \( \text{..} \) = 1.5 m
   Bligh’s coefficient \( C \) = 1/6

OR

4'(c) Using following data, design the expansion transition of a siphon aqueduct.
   Discharge of canal = 30 m³/s
   Bed width of canal = 20 m
   Depth of water in the canal = 1.8 m
   Bed level of canal = 160.00 m
   High flood discharge of the drainage = 350 m³/s
   High flood level of the drainage = 160.5m
   Bed level of the drainage = 158.00 m
2018-19
B.E (AUTUMN SEMESTER) EXAMINATION
CIVIL ENGINEERING
ECE429
INDUSTRIAL POLLUTION CONTROL
Maximum Marks: 60
Credits: 04
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>Question</th>
<th>M.M.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1(a)</td>
<td>Discuss any three briefly</td>
<td>[9]</td>
</tr>
<tr>
<td></td>
<td>i. Lofting and Coning plume behaviour</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ii. Mechanism of deterioration of material in polluted atmosphere.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>iii. Different sources of air pollution.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>iv. Ambient Lapse Rate (ALR) and Dry Adiabatic Lapse Rate (DALR).</td>
<td></td>
</tr>
<tr>
<td>1(b)</td>
<td>Discuss the effect of oxides of Nitrogen, Sulphur and Carbon on our environment.</td>
<td>[6]</td>
</tr>
<tr>
<td>OR</td>
<td>1(b') Briefly discuss the neutrally stable and stable inversion atmosphere in accordance to Pasquill Stability classes.</td>
<td>[6]</td>
</tr>
<tr>
<td>2(a)</td>
<td>Briefly explain the working of Cyclone Collector and Wet Cyclone Scrubbers with diagram. The diameter of a cyclone is 3 m, workout other dimensions of this cyclone unit.</td>
<td>[7.5]</td>
</tr>
<tr>
<td>2(b)</td>
<td>In a cement industry settling chamber is to be used to collect particles of 40 μm in diameter and 2000 kg/m³ density from a stream of 12 m³/s from a stream of standard air. If the chamber is 2 m wide, 1.75 m high and it is having 8 trays including the bottom surface. What should be its length to attain theoretically perfect efficiency. Assume flow to be laminar. μ= 1.84×10⁻⁵ kg/ms. What will be the collection efficiency L=0.1 m number of trays= 200 and particle diameter is 25 μm.</td>
<td>[7.5]</td>
</tr>
</tbody>
</table>
3(a) Write the significance of characterizing Industrial wastewater, its treatment and overall management up till disposal. Also write the step wise procedure of carrying out Industrial survey.

3(b) Briefly discuss the importance of Equalization tank before secondary treatment of wastewater. Design a rectangular Equalization Tank for a stream of wastewater generated by a locality on an hourly basis recorded as shown in table below.

<table>
<thead>
<tr>
<th>Time (hrs)</th>
<th>2</th>
<th>4</th>
<th>6</th>
<th>8</th>
<th>10</th>
<th>12</th>
<th>14</th>
<th>16</th>
<th>18</th>
<th>20</th>
<th>22</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cumulative Flow (m³/hr)</td>
<td>650</td>
<td>1100</td>
<td>2000</td>
<td>4250</td>
<td>8750</td>
<td>12600</td>
<td>16000</td>
<td>18200</td>
<td>22000</td>
<td>21500</td>
<td>22200</td>
<td>22500</td>
</tr>
</tbody>
</table>

OR

3(b') Discuss the issue of Water Reclamation & Reuse. Explain the impact if Industrial wastewater is sent for Secondary treatment without Neutralization? Also write the tolerance limits for discharge of any 3 of the following environmental pollutants for Inland surface water & Public Sewers areas:

a) BOD  
b) Lead  
c) Cadmium  
d) Phenolic compounds

4(a) Explain the working of ponds & lagoons along with proper diagram. Also discuss the benefits and constraints of aerobic treatment in Lagoons over UASB process.

4(b) Explain the manufacturing process, wastewater characteristics of Distillery or Tannery. Also Suggest a treatment scheme for large scale industry of the same.
Department of Civil Engineering  
Aligarh Muslim University  
B. E. IV Year End-Semester Examination: Autumn 2018-19  
ECE 430 (Backlog) Structural Analysis II

Attempt all the questions.  
Notations have their usual meanings.  
Assume missing data, if any.  

Max. Marks: 60  
Time Duration: 2 hrs.

Q 1a  Calculate bending moment in beams and columns in the frame given in Fig. 1 using Portal method. Take $EI$ constant for all members.  

Q 1b  Calculate bending moment at joints and supports in the frame given in Fig. 2 using Kani's method. (Give at least three iterations.)  

OR

Q 1b' Calculate bending moment at joints and supports in the sway frame given in Fig. 3 using Kani's method. Take $EI$ constant for all members. (Give at least three iterations.)

Q 2a  Define stiffness and flexibility in a structural system. What is the difference between Force and Displacement method?

Q 2b  Develop the stiffness or flexibility matrix for beam $AB$ with reference to the coordinates shown in Fig. 4.

Q 3  Draw the influence lines for (i) reaction at $B$ and (ii) moment at $A$ for the propped cantilever shown in Fig. 5. Compute the ordinates at intervals of $2m$.

Q 4  Draw the influence lines of Shear Force for panel $CD$ and bending moment at any Point $P$ in $CD$ panel of a girder with floor beams shown in Fig. 6. Consider the length of each panel as ‘$d$’.

OR

Q 4' A Pratt Truss with inclined chords consisting of 6 panels each of $4m$ length is shown in Fig. 7. Draw the influence line for force in members $HI$, $BC$ and $BL$. $A$ and $G$ are pinned and roller supports, respectively. Take $BH = 4m$ and $CI = 5m$.
Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Fig. 6

Fig. 7

6 Panels @ 4m = 24m
Department of Civil Engineering
Aligarh Muslim University
B. E. IV Year End-Semester Examination: Autumn 2018-19
ECE 430N Structural Analysis II

Attempt all the questions.
Notations have their usual meanings.
Assume missing data, if any.

Max. Marks: 60
Time Duration: 2 hrs.

Q 1a  Calculate bending moment in beams and columns in the frame given in Fig. 1 using Portal method. Take $EI$ constant for all members. [5]

Q 1b  Calculate bending moment at joints and supports in the frame given in Fig. 2 using Kani's method. (Give at least three iterations.) [10]

OR

Q 1b' Calculate bending moment at joints and supports in the sway frame given in Fig. 3 using Kani's method. Take $EI$ constant for all members. (Give at least three iterations.) [10]

Q 2a  Define stiffness and flexibility in a structural system. What is the difference between Force and Displacement method? [3]

Q 2b  Develop the stiffness or flexibility matrix for beam $AB$ with reference to the coordinates shown in Fig. 4. [12]

Q 3  Draw the influence lines for (i) reaction at $B$ and (ii) moment at $A$ for the propped cantilever shown in Fig. 5. Compute the ordinates at intervals of 2m. [15]

Q 4  Draw the influence lines of Shear Force for panel $CD$ and bending moment at any Point $P$ in $CD$ panel of a girder with floor beams shown in Fig. 6. Consider the length of each panel as $'d'$. [15]

OR

Q 4' A Pratt Truss with inclined chords consisting of 6 panels each of 4m length is shown in Fig. 7. Draw the influence line for force in members $HI$, $BC$ and $BL$. $A$ and $G$ are pinned and roller supports, respectively. Take $BH = 4$ m and $CI = 5$m. [15]
Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Fig. 6

Fig. 7

6 Panels @ 4m = 24m
2018-19  
B.E. VII SEMESTER (CIVILENGINEERING) EXAMINATION  
ECE 437  PRESTRESSED CONCRETE  

Maximum Marks: 60  
Credits: 04  
Duration: Two Hours  

Note:  
1. Answer all the questions.  
2. Assume suitable data if missing.  
3. Notations used have their usual meaning.  
4. Use of IS: 1343 (2012) is permissible.  

Q.No.  

1. (a) A beam is prestressed by a cable carrying an initial prestress of 900 MPa. Calculate the percentage loss of prestress due to shrinkage of concrete for pre-tensioned and post-tensioned beam. Age of concrete at transfer = 28 days  

1. (b) A rectangular concrete beam 300 mm wide and 600 mm deep is pre-stressed with a force of 1565 kN applied at 180 mm from the bottom, the force finally reducing to 1361 kN. The span of the beam is 12.20 m and it carries two equal points loads 45 kN each at a distance of 4.60 m from the each support. Find the extreme fibre stress at mid span under (i) initial pre-stress and no live load, and (ii) final condition. Assume unit weight of concrete as 25 kN/m³.  

2. A 12 m prestressed concrete beam of rectangular cross section carries two-point load of 120 kN (including its self weight) acting each at one-third span. Design the section for M45 grade of concrete and 1500 MPa characteristics strength of prestressing steel.  

OR  

2'. A post-tensioned bonded T-section has a flange width 1200 mm and thickness 200 mm. The web thickness and depth is 250 mm and 1500 mm respectively. The area of prestressing steel is 4000 mm² located at an effective depth of 1650 mm. If the characteristics cube strength of concrete and tensile strength of steel are 45 MPa and 1600 MPa respectively, estimate the ultimate moment capacity of T-section.  

3. (a) With the help of neat sketches, discuss the effect of depth of anchor plate on the distribution of transverse compressive and tensile stresses in the end block of a post-tensioned beam.  

3. (b) A section of a pre-stressed concrete beam 250 mm × 400 mm carries a factored shear force of 120 kN and a factored bending moment 35 kNm. The effective pre-stress after all losses is 900 MPa. Compressive stress at centroidal axis due to pre-stress is 6.0 N/mm². Design suitable shear reinforcement. Assume σₑₖ = 40MPa; σₚ = 1600 MPa; Aₚ = 175 mm² and cover to the reinforcement is 60 mm.  

OR  

contd... 2.
3'. (b) The end block of a post-tensioned beam 300×400 mm has 125 mm square bearing plate subjected to 1600 kN force. Design the transverse reinforcement to contain the bursting force. Use Fe415 grade of steel. Also show the reinforcement in end zone.

4. (a) Derive an expression for the area of the concrete section and the factor of safety of a pre-stressed concrete tie member subjected to axial tension.

4. (b) Design a tension member of 20 m length subjected to 1000 kN axial tension and also determine the factor of safety. Use grade of concrete = M40; characteristics strength of prestressing steel = 1600 MPa
2018-19  
B.E. VII SEMESTER EXAMINATION  
CIVIL ENGINEERING  
ELEMENTS OF EARTHQUAKE AND WIND ENGINEERING  
ECE-445N

Maximum Marks: 60  
Duration: Two hours

<table>
<thead>
<tr>
<th>Q.No.</th>
<th>Question</th>
<th>MM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1(a)</td>
<td>What is Theory of Plate Tectonics? Describe in detail different types of plate boundaries.</td>
<td>[05]</td>
</tr>
<tr>
<td>1(b)</td>
<td>Explain the term seismic zoning. Discuss the use of seismic zoning maps.</td>
<td>[05]</td>
</tr>
<tr>
<td>1(c)</td>
<td>During an earthquake the maximum amplitude recorded at a site by seismograph is 30 cm. The maximum ground velocity recorded was 25 cm/s. The site was found to be 85kM away from the epicentre. Determine the magnitude and intensity of earthquake.</td>
<td>[05]</td>
</tr>
<tr>
<td>OR</td>
<td>1'(a) What is seismic hazard analysis? Explain probabilistic approach of seismic hazard analysis.</td>
<td>[05]</td>
</tr>
<tr>
<td>1'(b)</td>
<td>What is response spectrum? How do you obtain it?</td>
<td>[05]</td>
</tr>
<tr>
<td>1'(c)</td>
<td>Estimate the moment magnitude of an event with rupture length of 100kM, rupture width of 45kM and average fault slip of 3m. Take modulus of rigidity as $4 \times 10^{10}$ N/m².</td>
<td>[05]</td>
</tr>
<tr>
<td>2</td>
<td>A three storey building modelled as three degree of freedom system with each lumped mass and storey stiffness is shown in Fig.1. Find the natural frequencies and mode shapes for the system.</td>
<td>[15]</td>
</tr>
<tr>
<td>3(a)</td>
<td>Define bands with neat sketches. At what levels in a masonry building would you provide them? Give justifications for each of them.</td>
<td>[06]</td>
</tr>
<tr>
<td>OR</td>
<td>3(a) Discuss and sketch the ductile detailing of reinforcement in Beam-column Joint and column as per IS 13920.</td>
<td>[06]</td>
</tr>
<tr>
<td>3(b)</td>
<td>The plan and elevation of a three storey residential building is shown in Fig.2(a-b). The building is located in seismic zone V. The type of soil encountered is hard 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 earthquake forces at different floor levels.</td>
<td>[09]</td>
</tr>
<tr>
<td>4(a)</td>
<td>Briefly discuss the lessons learnt from damages of RC buildings under past Earthquakes?</td>
<td>[06]</td>
</tr>
<tr>
<td>OR</td>
<td>4'(a) Describe the various Earthquake resistant features that can be introduced in a masonry building to make it Earthquake resistant.</td>
<td>[06]</td>
</tr>
</tbody>
</table>

Contd.(2)
4(b) A multi-storeyed building shown in Fig. 3(a-b) having 20m x 30m plan dimensions and an overall height of 30m is to be designed at Vadodara 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.

**FIGURES**

![Fig. 1](image1.png)  
Fig. 1

![Fig. 2(a): Plan](image2.png)  
Fig. 2(a): Plan

![Fig. 2(b): Elevation](image3.png)  
Fig. 2(b): Elevation

![Fig. 3(a): Plan](image4.png)  
Fig. 3(a): Plan

![Fig. 3(b): Section X-X](image5.png)  
Fig. 3(b): Section X-X