CE 303 : STRUCTURAL ANALYSIS II

MODULE 1

1. (a) Explain static determinacy and kinematic determinacy with two examples each. [KU Nov 2014] (6 marks)
   (b) Derive the equations of three moment theorem [KU Jan 2018] (14 marks)

2. (a) State and explain Clapeyron’s method of three moments. [KU Sep 2016] (6 marks)
   (b) Derive the expression of Clapeyron’s theorem subjected to general loading. (14 marks)

3. Analyse the continuous beam by three moment method and draw the SFD and BMD. [KU Sep 2016] (20 marks)

4. Analyse the continuous beam by three moment method and draw the SFD and BMD. [KU Sep 2016] (20 marks)

5. A beam ABCD fixed at ends A and D is subjected to loading as shown in the figure. The support B settles by an amount 5mm. Analyse the continuous beam by using clapeyron’s theorem and draw SFD and BMD. (20 marks)

6. Analyze the continuous beam shown in figure using three moment theorem. [KTU Dec 19, 15 marks]
7. Write three moment equation and mention the terms involved it. [KTU Sept 20, 4 marks]

8. Derive the equation for Clapeyron’s three moment theorem considering unequal settlement of supports, different span lengths and different moment of inertia for adjacent spans. [KTU May 19, 10 Marks]

9. The ends A and C of a two-span continuous beam ABC are fixed and B is provided with roller support. Span AB is 4m long and carries a UDL of 15kN/m. BC has a span of 2m and carries a concentrated load of 80kN at 1.5m from the fixed end C. Analyse the beam ABC by the theorem of three moments and plot the BMD and SFD. Assume EI constant. [KTU May 19, 15 marks]

**MODULE 2**


    (b) What are the causes of side sway in portal frames? [KU Nov 2014, Nov 2013, Sep 2016] (6 marks)

    (c) Explain how the shear equation is developed for a single bay single storey frame. [KU Nov 2011] (8 marks)

11. (a) Explain approximate method of analysis for multi-storeyed frames. [KU Sep 2016] (8 marks)

    (b) Analyse a propped cantilever carrying udl using slope deflection method. [KU Nov 2011] (12 marks)

12. Analyse the continuous beam shown in the figure by using slope deflection method. The support B sinks by 15 mm. Take $E = 200 \times 10^5$ kN/m² and $I = 120 \times 10^{-6}$ m⁴. [KU Jan 2018] (20 marks)

13. Analyse the portal frame by slope deflection method and draw the BMD. [KU Jan 2018] (20 marks)
14. Analyse the continuous beam by slope deflection method and draw the SFD and BMD. [KU Sep 2016] (20 marks)

15. Analyse the portal frame by slope deflection method and draw the BMD. [KU Oct 2016] (20 marks)

16. Using the slope deflection method, determine the moments at supports for the beam shown in Fig. 1 if the support B sinks by 10mm. Given I=1.32x10^8 mm^4 and E=2x10^5 N/mm^2. [KTU May 19, 15 Marks]
17. (a) Explain the moment distribution method for portal frames with side sway. [KU Nov 2014, Sep 2016] 
(8 marks)
(b) Explain the concept of carry over moment and distribution factor in moment distribution method and derive the same. 
(12 marks)
18. Analyse the portal frame by moment distribution method and draw the BMD (EI Constant) 
[KU Nov 2014] 
(20 marks)

19. Analyse the portal frame by moment distribution method and draw the BMD. [KU Dec 2016] 
(20 marks)

20. Analyse the rigid frame shown in the figure using moment distribution method and draw the BMD. [KU Jan 2018] 
(20 marks)
21. Analyse the portal frame by moment distribution method and draw the BMD. [KU Nov 2011] (20 marks)

22. Analyse the portal frame by moment distribution method and draw the BMD. [KU Nov 2013, Dec 2015] (20 marks)

23. Analyse the continuous beam by moment distribution method and draw the BMD. [KU May 2012] (20 marks)

24. Analyse the portal frame by moment distribution method and draw the BMD. [KU Oct 2016] (20 marks)

25. Using moment distribution method, determine the support moments in the continuous beam ABCD. Due to external loading, support B settles by 5mm and C by 10mm. Assume EI as 80,000kN-m². Relative EI values are marked below each span. [KTU Dec 19, 15 marks]
26. Differentiate between absolute stiffness and relative stiffness. [KTU Dec 19, 5 marks]

27. Analyse the continuous beam given in Fig.3 by Moment distribution method and draw BMD. [KTU Sept 20, 15 marks]

28. Analyse the rigid frame ABCD by moment distribution method. Ends A and D are fixed. AB and CD are vertical members with moment of inertia I and length 4m. The horizontal member BC with moment of inertia 2I is 6m long and acted upon by a concentrated load of 100kN at 2m from B. [KTU May 19, 15 marks]

**MODULE 4**

29. (a) Derive rotation factor used in Kani's method. [KU Jan 2018] (5 marks)

   (b) Is it possible to determine the joint rotations and storey displacements in Kani's method of analysis? Explain. [KU Jan 2018] (10 marks)

   (c) What are the advantages of Kani's method? [KU Dec 2015] (5 marks)

30. Discuss the following terms and derive the same:

   (a) Displacement factors

   (b) Distribution factors

   (c) Storey moments

   (d) Rotation factors (20 marks)

31. Analyse the continuous beam by Kani's method and draw the BMD. [KU Nov 2014] (20 marks)
32. Analyse the portal frame by kani’s method and draw the BMD. [KU Nov 2011] (20 marks)

33. Analyse the portal frame by kani’s method and draw the BMD. [KU Nov 2013] (20 marks)

34. Analyse the portal frame by kani’s method and draw the BMD. [KU Oct 2016] (20 marks)

35. Analyse the three-span continuous beam ABCD by Kani’s method and draw BMD and SFD. Left end support A is fixed and all other supports are roller supports. Span AB=6m, BC=5m and CD=4m. Span AB carries a central concentrated load of 80kN, BC carries a concentrated load of 80 kN at 2m from B and CD carries a UDL of 30kN/m. EI is constant. [KTU May 19, 15 marks]

36. Analyse the continuous beam by Kani’s method and draw the BMD[KTU May 19, 15 marks]

35. Write down the analysis procedure of a continuous beam by Kani’s method [KTU Sept 20,
MODULE 5

37. (a) What are curved beams? [AU Dec 2015] (5 marks)
    (b) Give example of beams curved in plan [AU May 2018, AU May 2016] (3 marks)
    (c) Mention the components of forces acting on the beams curved in plan. [AU May 2017] (12 marks)

38. Analyse the quarter span beam of radius ‘r’ subjected to a point load at the free end. Draw SFD, BMD and TMD. Determine the vertical deflection at the free end.[KTU May 2017] . . . (20 marks)

39. Analyse the quarter span beam of radius ‘r’ subjected to a point load at the mid span. Draw SFD, BMD and TMD. Determine the vertical deflection at the free end and under the load.. [KTU May 2017] (20 marks)

40. Analyse the circular beam supported using 6 columns. Draw SFD, BMD and TMD. (20 marks)

41. A curved beam in the form of a quadrant of a circle of radius 3m and having a uniform cross-section is in a horizontal plane. It is fixed at A and free at B and carries a vertical concentrated load 30kN at the free end B. Draw shear force, bending moment and twisting moment diagrams [KTU Dec 19, 6 marks]

42. Find the bending moment at mid span of a semicircular beam uniformly loaded over the whole beam by a vertical load of intensity 10kN/m and simply supported at the ends and at midspan. Find also the bending moment and twisting moment at quarter points in the beam. Radius of the beam = 5m. [KTU Dec 19, 14 marks]

43. Analyse and draw bending moment and twisting moment diagrams for a beam semi circular in plan, and supported on three equally spaced hinges. The radius of the beam is 3.5 m and it carries a udl of 20 kN/m. [KTU Sept 20, 20 marks]

MODULE 6

44. (a) Explain about plastic collapse of steel structures. [KU Dec 2016] (4 marks)
    (b) Explain the term ‘mechanism’ as used in plastic analysis. What are the various independent mechanisms? [KU Apr 2014] (8 marks)
    (c) Find the plastic moment capacity of a propped cantilever carrying udl w/m by using static method of analysis. [KU Apr 2014] (8 marks)

45. (a) What is meant by shape factor? Determine shape factor for a rectangular section of size
(b) Determine the shape function of T section of size 120mm x 120mm x 10mm. [AU May 2018]

46. (a) What are the assumptions made in plastic analysis of structures? [KU Mar 2017, AU May 2016] (6 marks)
    (b) Define the mechanism in plastic theory. [KU May 2013] (8 marks)
    (c) Define (a) Plastic Hinge (b) Shape Factor [KU May 2013] (6 marks)

47. (a) Find the shape factor of a circular section. [KU May 2014] (4 marks)
    (b) Determine the length of plastic zone of a simply supported beam of rectangular section
        supporting a point load at the centre. [KU May 2011] (4 marks)
    (c) Explain the various theorems in plastic analysis. [KU Nov 2017] (5 marks)
    (d) Find the plastic moment capacity of a propped cantilever carrying udl w/m by using
        static method of analysis. [KU Apr 2014] (7 marks)

48. (a) A portal frame ABCD fixed at A and D is loaded with a point load of 20kN at the middle
    point of BC and a horizontal point of 10kN at the joint B towards right. The length of AB =
    5m, BC = 4m and CD = 2m. If the plastic moment of AB, BC and CD are respectively 2mp,
    mp and mp, determine the values of plastic moment. [KU May 2011] (10 marks)
    (b) A beam is fixed at both ends is subjected to udl ‘w’ on the ¾ length of the right support.
        Determine the value of collapse load, Wc. The beam is of uniform plastic moment ‘Mp’.
        [KU Apr 2014] (10 marks)

49. Find the collapse load for a continuous beam of a uniform cross section shown in the figure.
    [KU Mar 2017] (20 marks)

50. Determine the fully plastic moment of a continuous beam of uniform cross section shown in
    the figure. (20 marks)

51. A portal frame ABCD shown in the figure has uniform cross section throughout. Determine
52. Determine the plastic moment of resistance in terms of the load, Wc at the collapse. [AU Dec 2017] (20 marks)

53. Determine the shape factor of T-Section with flange width 120 mm. Depth of web is 110 mm. Thickness of flange and web is 10 mm. If the value of yield stress is 250 N/mm², find the plastic moment capacity of the section [KTU May 19, 10 marks]

54. Determine the value of collapse load for the portal frame shown in Fig 4. All the members have the same plastic moment of resistance. [KTU May 19, 20 marks]

55. List the assumptions in Plastic theory [KTU Sept 20, 5 marks]

56. State the three theorems of plastic collapse [KTU Dec 19, 5 marks]

57. Determine the shape factor for a triangular section of base b and height h [KTU Dec 19, 5 marks]

58. Determine the collapse load (W_c) for the fixed beam by kinematic method [KTU Dec 19, 15 marks]
<table>
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<th></th>
<th>Define characteristic load. How to estimate the design loads in limit state method?</th>
<th>KU, JAN 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Derive the expression for limiting depth of neutral axis if the yield stress of steel is 250 N/mm²</td>
<td>KU, JAN 2018</td>
</tr>
<tr>
<td>3</td>
<td>Explain design loads and design strength of material?</td>
<td>KU, SEPT 2016</td>
</tr>
<tr>
<td>4</td>
<td>Briefly explain working stress method of RCC design?</td>
<td>KU, SEPT 2016</td>
</tr>
<tr>
<td>5</td>
<td>Define limit state and discuss various limit state design.</td>
<td>KU, SEPT 2016</td>
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<tr>
<td>6</td>
<td>Why is partial safety factor for concrete is greater than that of reinforcing steel?</td>
<td>KU, NOV 2011</td>
</tr>
<tr>
<td>7</td>
<td>Differentiate between working stress and limit state method?</td>
<td>KU, NOV 2011</td>
</tr>
<tr>
<td>8</td>
<td>Define characteristic strength of material?</td>
<td>KTU, DEC 2018</td>
</tr>
<tr>
<td>9</td>
<td>What are the objectives of RCC Design?</td>
<td>KTU, DEC 2018</td>
</tr>
<tr>
<td>10</td>
<td>Explain balanced, under-reinforced and over-reinforced sections in the context of Limit state design philosophy.</td>
<td>KTU, DEC 2017</td>
</tr>
<tr>
<td>11</td>
<td>Derive the expressions for stress block parameters in limit state of flexure and hence the expression for moment of resistance of a singly reinforced rectangular section.</td>
<td>KTU, DEC 2017</td>
</tr>
<tr>
<td>12</td>
<td>Determine the ultimate moment of resistance of a singly reinforced beam of width 300mm and effective depth 450mm reinforced with 3 bars of 25mm diameter. Assume M20 grade concrete and Fe415 grade steel.</td>
<td>KTU, DEC 2017</td>
</tr>
<tr>
<td>13</td>
<td>Find the moment of resistance of a beam section with width 250 mm, effective depth 360 mm and reinforced with 3 Nos 16 mm dia. bars. Use M25 concrete and Fe 415 steel.</td>
<td>KTU, APRIL 2018</td>
</tr>
<tr>
<td>14</td>
<td>Explain with figures the stress strain relationship of mild steel.</td>
<td>KTU, APRIL 2018</td>
</tr>
<tr>
<td>15</td>
<td>Determine the central concentrated load that can be carried by a simply supported singly reinforced beam of 250 mm x 500 mm reinforced with 4 bars of 20mm diameter with an effective cover</td>
<td>KTU, MAY 2019</td>
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</tbody>
</table>
of 50mm. Effective span of beam is 5.5m. Use M20 concrete and Fe415 steel.

<table>
<thead>
<tr>
<th>Question</th>
<th>Date</th>
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<tbody>
<tr>
<td>16 A rectangular beam 250mm wide and effective depth 450 mm has 4 bars of 20mm diameter. Find the moment of resistance of the section if M20 concrete and Fe 415 grade steel are used. As per IS 456:2000 find the limiting moment of resistance also.</td>
<td>KTU, May 2019</td>
</tr>
<tr>
<td>17 Explain the terms Characteristic strength and Characteristic load.</td>
<td>KTU, May 2019</td>
</tr>
<tr>
<td>18 Distinguish between balanced, over-reinforced and under-reinforced sections in limit state design. Which of these should be recommended in design?</td>
<td>KTU, Dec 2019</td>
</tr>
<tr>
<td>19 Find the moment of resistance of a singly reinforced concrete beam of 200 mm width and 400 mm effective depth, reinforced with 4 bars of 16 mm diameter of Fe415 steel. Take M20 concrete. Redesign the beam if necessary.</td>
<td>KTU, Dec 2019</td>
</tr>
<tr>
<td>20 With neat sketch explain the stress block parameters used in the design of singly reinforced concrete beam as per limit state method.</td>
<td>KTU, Dec 2019</td>
</tr>
<tr>
<td>21 Why are over reinforced sections not used in practice?</td>
<td>KTU, Sep 2020</td>
</tr>
<tr>
<td>22 A concrete beam has 300 mm breadth and 500 mm effective depth; effective cover 50 mm, reinforced with 3 nos. 20 mm diameter steel bars at tension side. M20 concrete and Fe 415 grade steel are used. Determine the moment of resistance.</td>
<td>KTU, Sep 2020</td>
</tr>
<tr>
<td>23 Explain characteristic strength of concrete and steel.</td>
<td>KTU, Sep 2020</td>
</tr>
<tr>
<td>24 Explain with figure the stress strain relationship of mild steel.</td>
<td>KTU, Sep 2020</td>
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**MODULE 2**

<table>
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<tr>
<th>Question</th>
<th>Date</th>
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</thead>
<tbody>
<tr>
<td>1 List various types of shear reinforcements commonly used. Explain each with neat sketches.</td>
<td>KTU Dec 2017</td>
</tr>
<tr>
<td>2 What is bond in reinforced concrete? Define development length and derive an expression for development length.</td>
<td>KTU Dec 2017</td>
</tr>
<tr>
<td>3 A simply supported beam 230mm x 550mm effective depth, is reinforced with 4 bars of 20mm diameter on the tension face. If the</td>
<td>KTU Dec 2017</td>
</tr>
</tbody>
</table>
Beam is subjected to a vertical shear of 100 kN at the critical section, check the adequacy of the section in shear and design the shear reinforcement, if necessary. Use M25 concrete & Fe415 grade steel.

4 Design the stirrups of a beam section of width 200 mm and effective depth 400 mm. The shear force is 100 kN and the percentage of tensile reinforcement is 0.6. Use M20 concrete and Fe 415 steel.  

5 Differentiate between flexural bond and development bond  

6 A 250 mm wide RC beam with 400mm effective depth is reinforced with 3 numbers 20mm diameter bars of Fe 415 grade steel. The beam is provided with 8mm diameter 2 legged vertical stirrups at 150mmc/c as shear reinforcement and one of the longitudinal bars is bent up at 450 nearer to support as per IS 456:2000. Determine the design strength of the section in shear if the concrete used is of M20 grade.  

7 Design the shear reinforcement for a simply supported RC beam of effective span 6m with width 300mm and depth 500mm and carrying a superimposed load of 12kN/m. The beam is reinforced with 4 bars of 20 mm diameter. Use M20 concrete and Fe 415 grade steel. Effective cover to reinforcement 50mm.  

8 What are the advantages and disadvantages of providing large clear cover to reinforcement in flexural members?  

9 Explain how the longitudinal reinforcement bent up nearer to the supports contribute to the shear resistance of RC beams?  

10 A 250 mm wide RC beam with 450mm depth is reinforced with 4 numbers 16 mm diameter bars of Fe 415 grade steel. Effective cover to reinforcement is 50mm. The beam is provided with 8 mm diameter 2 legged vertical stirrups at 160 mm/c as shear reinforcement. M20 concrete is used. Determine the design strength in shear and also its limiting value.  

11 Design the shear reinforcement for a simply supported RC beam of effective span 5m with width 300mm and effective depth
<table>
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<th>Question</th>
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<tbody>
<tr>
<td>400mm and carrying a superimposed load of 10 kN/m. The beam is reinforced with 3 bars of 20 mm diameter. Use M20 concrete and Fe 415 grade steel.</td>
<td>KTU, May 2019</td>
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<tr>
<td>Why does the code impose minimum and maximum limits with regard to (i) spacing and (ii) percentage area of flexural reinforcement?</td>
<td>KTU, May 2019</td>
</tr>
<tr>
<td>Design the shear reinforcement for a beam with b= 350 mm, d= 550 mm, Vu=125 kN, fck= 25 N/mm², fy= 415 N/mm². Percentage of steel is 1.67 percent.</td>
<td>KTU, Dec 2019</td>
</tr>
<tr>
<td>A simply supported beam, 300 mm wide and 600 mm effective depth carries a uniformly distributed load of 74 kN/m including its own weight over an effective span of 6 m. The reinforcement consists of 5 bars of 25 mm diameter. Out of these, two bars can be safely bent up at 1 m distance from the support. Design shear reinforcement for the beam.</td>
<td>KTU, Dec 2019</td>
</tr>
<tr>
<td>Define development length and derive an expression for development length.</td>
<td>KTU, Dec 2019</td>
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<tr>
<td>What is the purpose of providing development length?</td>
<td>KTU, Sep 2020</td>
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<tr>
<td>Design the shear reinforcement for a beam section of width 200 mm and effective depth 500 mm. The factored shear force is 100 kN and it is reinforced with 3 Nos 16 mm diameter bars on the tension side at the critical section. Use M20 concrete and Fe 415 steel.</td>
<td>KTU, Sep 2020</td>
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<tr>
<td>Explain anchorage of reinforcing bars.</td>
<td>KTU, Sep 2020</td>
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**MODULE 3**

<table>
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<tr>
<th>Question</th>
<th>Reference</th>
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<tbody>
<tr>
<td>Design and detail a singly reinforced concrete beam of rectangular section subjected to a uniformly distributed live load of 12 kN/m over the entire span. Clear span is 5m. The beam is supported on masonry wall, 230mm thick on both sides. Assume moderate exposure conditions. Use M25 grade concrete and Fe415 grade steel.</td>
<td>KTU, Dec 2017</td>
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<td>Question</td>
<td>Reference</td>
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<tr>
<td>What are the situations which demand doubly reinforced section?</td>
<td>KTU DEC 2017</td>
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<tr>
<td>Derive the expression for ultimate moment of resistance of a doubly</td>
<td></td>
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<tr>
<td>reinforced rectangular section.</td>
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<td>Draw the longitudinal and cross sections showing the reinforcement</td>
<td>KTU, april 2018</td>
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<tr>
<td>detailing for a cantilever beam.</td>
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<tr>
<td>Design a rectangular beam section to resist a bending moment of 30</td>
<td>KTU, April 2018</td>
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<tr>
<td>kNm. Use M20 concrete and Fe 415 steel.</td>
<td></td>
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<tr>
<td>Design a rectangular beam section to resist a factored bending moment</td>
<td>KTU, April 2018</td>
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<tr>
<td>of 575 kNm. The size of the section is limited to 300 mm x 700 mm</td>
<td></td>
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<tr>
<td>overall. Use M20 concrete and Fe 415 steel.</td>
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<tr>
<td>State the conditions when a doubly reinforced beam is preferred.</td>
<td>KTU, April 2018</td>
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<tr>
<td>Design a simply supported beam of span 6m subjected to a live load of</td>
<td>KTU, DEC 2018</td>
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<tr>
<td>5kN/m. Use M20 concrete and Fe 415 steel.</td>
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<tr>
<td>Design the shear reinforcement required for a reinforced concrete beam</td>
<td>KTU, DEC 2018</td>
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<tr>
<td>300 mm x 600 mm to carry a factored moment of 120 kNm, a factored shear</td>
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<tr>
<td>force of 100 kN and a factored Torsional moment of 60 kNm. Use M25</td>
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<tr>
<td>concrete and Fe 415 steel. Effective cover to reinforcement 50 mm.</td>
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<tr>
<td>Design a simply supported beam of span 6m subjected to a live load of</td>
<td>KTU, May 2019</td>
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<tr>
<td>4 kN/m. Use M20 concrete and Fe 415 steel.</td>
<td></td>
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<tr>
<td>Is it correct to model the interior beams in a continuous beam supported</td>
<td>KTU, May 2019</td>
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<tr>
<td>slab system as T beams to determine their flexural strength at all</td>
<td></td>
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<td>sections?</td>
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<tr>
<td>Determine the longitudinal reinforcement required for a rectangular</td>
<td>KTU, May 2019</td>
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<tr>
<td>beam section with b=300 mm, d=550mm, Mu=100kNm, Tu=45kNm, Vu=80 kN.</td>
<td></td>
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<tr>
<td>Adopt M20 concrete and Fe 415 steel.</td>
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<tr>
<td>What are the situations that demand double reinforcement in beams?</td>
<td>KTU, DEC 2019</td>
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<tr>
<td>Compare the stress strain distributions in singly reinforced and</td>
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<td>doubly reinforced beams.</td>
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<tr>
<td>Determine the moment of resistance of beam having width b of 350 mm,</td>
<td>KTU, DEC 2019</td>
</tr>
<tr>
<td>depth of 900 mm with a cover of 50 mm. Beam is reinforced with 5</td>
<td></td>
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<tr>
<td>tension reinforcements of 20 mm HYSD bars.</td>
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</tbody>
</table>
(Fe 415) and 2 compression reinforcements of 20 mm Fe 415 steel. Grade of concrete is M15.

14 A T-beam has the following data: width of flange= 750 mm, Breadth of beam= 250 mm, Effective depth= 500 mm, Thickness of flange= 90 mm. Determine the limiting moment of resistance of the beam. Use M20 concrete and Fe415 steel.

15 What are T and L beams?

16 Design a rectangular beam section of width 200 mm to resist a bending moment of 30 kNm. Use M20 concrete and Fe 415 steel.

17 Design a simply supported rectangular beam of effective span 6m carrying a super imposed load of 35kN/m. The overall depth of beam is restricted to 550 mm and width 300 mm. Use M20 and Fe 415

18 Determine the ultimate moment of resistance of a T beam having an effective flange width of 800mm, effective depth 500 mm, web width 300 mm, depth of flange 100 mm. area of tension steel 1962 mm². Use M20 and Fe415

19 Design a simply supported beam to carry a superimposed load of 20KN/m over a clear span of 7m. Depth of he beam is limited to 500 mm. Support width is 250 mm. Use M20 concrete and Fe 415 Steel.

20 Design a rectangular beam section of width 200 mm to resist a bending moment of 30 kNm. Use M20 concrete and Fe 415 steel

**MODULE 4**

1 Sketch typical reinforcement detail in a continuous slab.

2 Determine the ultimate moment of resistance of a doubly reinforced rectangular beam of width 300mm and overall depth 600mm reinforced with 3-32mm diameter bars on tension side and 2-25mm diameter bars on compression side. Assume effective cover on both sides as 50 mm. Use M20 concrete & Fe250 steel

3 Differentiate between one way slab and two way slab.
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<tr>
<td>4</td>
<td>Design and detail a simply supported slab for a room of interior dimension 8m x 3.5m, subjected to an imposed load of 8kN/m2. Thickness of supporting wall is 300mm. Use M20 concrete and Fe415 steel. Assume moderate exposure conditions.</td>
</tr>
<tr>
<td>5</td>
<td>Design a slab for a room 3 m x 7 m clear in size. Use M20 concrete and Fe 415 steel. The live load is 2 kN/m2. Draw top plan and bottom plan to show the reinforcement detailing.</td>
</tr>
<tr>
<td>6</td>
<td>Design a simply supported RC slab for a room having inside dimensions 3m x 7.5m. Thickness of supporting wall is 230mm. The Live Load on slab is 2kN/m2. Floor finish 1kN/m2. Use M20 concrete and Fe 415 steel.</td>
</tr>
<tr>
<td>7</td>
<td>Draw the reinforcement detailing of (i) cantilever slab (ii) one way continuous slab</td>
</tr>
<tr>
<td>8</td>
<td>Design a cantilever slab of span 2m to carry imposed load of 2 kN/m2 over its entire span. Finish load=0.5 kN/m2. Use M20 concrete and Fe415 steel. The slab is supported by a beam of size 300mmx500mm.</td>
</tr>
<tr>
<td>9</td>
<td>Draw the reinforcement detailing of a simply supported one way slab</td>
</tr>
<tr>
<td>10</td>
<td>Design a simply supported RCC slab for a roof of a hall 4 m × 10 m (inside dimensions) with 230 mm walls all around. Assume a live load of 4 kN/m2 and finish 1 kN/m2. Use M 25 concrete and Fe 415 steel.</td>
</tr>
<tr>
<td>11</td>
<td>Design a one way slab with 3.5 m clear span supported on 230 mm thick walls on all four sides. The edges are simply supported. The live load on the slab is 2 kN/m2. Use M 20 concrete and Fe 415 steel.</td>
</tr>
<tr>
<td>12</td>
<td>Why do we provide reinforcement in two directions in a one way slab?</td>
</tr>
<tr>
<td>13</td>
<td>Draw a typical detailing of a continuous slab.</td>
</tr>
<tr>
<td>14</td>
<td>Design a simply supported slab for a room of size 4m X 5m clear size .Thickness of support 300 mm .the corners are held down.Live load 3 KN/m2 .Use M20 and Fe 415</td>
</tr>
</tbody>
</table>
### Design assignments:

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>Design a RCC slab for a room with clear interior dimensions 4m X 5m. Assume live load 3KN/m². The slab is simply supported on all four sides with corners free to lift up. Support width is 230 mm. Use M20 concrete and Fe415 steel.</td>
</tr>
</tbody>
</table>

### Module 5

<table>
<thead>
<tr>
<th>No.</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Explain the procedure for flexural crack width estimation in reinforced concrete members as per IS 456.</td>
</tr>
<tr>
<td>2</td>
<td>Design and detail a simply supported slab for a room of interior dimension 5mx4m, subjected to an imposed load of 8 kN/m². Corners of the slab are restrained against lift up. Use M20 concrete and Fe415 steel. Assume moderate exposure conditions. Perform all necessary checks except shear check.</td>
</tr>
<tr>
<td>3</td>
<td>Explain how deflection serviceability is ensured on beams.</td>
</tr>
<tr>
<td>4</td>
<td>Design an RCC slab for a room 3 m x 4 m clear in size. Use M20 concrete and Fe 415 steel. The live load is 2 kN/m². The edges are simply supported and the corners are held down. Draw top plan and bottom plan to show the reinforcement detailing.</td>
</tr>
<tr>
<td>5</td>
<td>Design a reinforced concrete slab 4m x 5m simply supported on all the four sides subjected to a live load of 4kN/m². Use M25 concrete and Fe 415 steel. Assume that the corners of the slab are held down.</td>
</tr>
<tr>
<td>6</td>
<td>A reinforced concrete beam of size 250 mm x 450 mm is provided with 4 bars of 20mm with an effective cover of 50 mm. Bending moment to be resisted is 50kNm. Determine the crack width at point which is the midpoint of tension edge. Adopt M20 concrete and Fe415 steel.</td>
</tr>
<tr>
<td>7</td>
<td>Design an interior panel of a continuous slab system with effective dimensions 4m x 5m subjected to a live load of 3 kN/m². Use M20 concrete and Fe 415 steel.</td>
</tr>
<tr>
<td>8</td>
<td>Differentiate between short term and long term deflections of RC.</td>
</tr>
</tbody>
</table>
9. Design a reinforced concrete slab $6.3 \times 4.5$ m simply supported on all the four sides. It has to carry a characteristic live load of 10 kN/m² in addition to its dead weight. Assume M25 concrete and Fe 415 steel; also assume mild exposure conditions.

10. Explain the procedure for estimation of flexural crack width in reinforced concrete members as per IS456.

11. How does one (a) check for deflections of two way slabs, and (b) control crack width in two way slabs?

12. Design a slab $3 \times 4$ m clear in size supported on 300 mm thick walls on all four sides, and corners held down. The live load on slab 3 kN/m². Use M20 concrete and Fe415 steel. Draw all the detailing required for the slab.

13. Explain limit state of serviceability.

14. Design a two way slab $3.5 \times 3.5$ m simply supported in all four sides. The corners are held down. The live load on slab is 3 kN/m². Assume M20 concrete and Fe415 steel.

15. Design a two way slab $4 \times 5$ m clear in size supported on 300 mm thick walls on all four sides and corners not held down. The live load is 4 KN/m². Use M20 and Fe415 steel.

16. Explain the procedure to determine the
   (a) crack width
   (b) Shrinkage deflection
   (c) Long term Deflection

17. Briefly explain the IS code stipulations for crack width
**MODULE 6**

1. Design and detail a dog legged stair for an office building for the following data:
   - Clear height between floors = 3.2m, Rise = 160 mm, Tread = 270mm, Width of flight = 1.25m, Landing width = 1.25m, Live load = 5kN/m², Load of finish = 1kN/m². Assume the stair to be supported on 230mm thick masonry walls at the outer edges of landing, parallel to the risers. Assume M20 concrete and Fe415 steel and Mild exposure conditions. Perform all necessary checks except shear check.  
   - KTU DEC 2017

2. Define slenderness ratio. What are its implications in the design of RC comp members?  
   - KTU DEC 2017

3. List the functions of transverse reinforcement in column. Sketch various types of transverse reinforcements commonly used.  
   - KTU DEC 2017

4. Design a short square column to carry a factored axial load of 3000kN, using M20 concrete and Fe415 steel.  
   - KTU DEC 2017

5. Differentiate between short and long columns.  
   - KTU, April 2018

6. Design a square column to carry an axial load of 1000 kN. Use M20 concrete and Fe415 steel. Draw a longitudinal section and a cross section showing the reinforcement.  
   - KTU, April 2018

7. Explain the function of lateral tie in a column.  
   - KTU, April 2018

8. Design a circular column with horizontal ties to carry an axial load of 1000 kN. Use M20 concrete and Fe415 steel. Draw a longitudinal section and a cross section showing the reinforcement.  
   - KTU, April 2018

9. Design a short circular column of effective length 3.3m to carry an axial load of 1200 kN. Provide helical reinforcement as transverse reinforcement. Use M25 concrete and Fe415 steel.  
   - KTU, DEC 2018

10. Briefly explain the load distribution in dog legged stair  
    - KTU, DEC 2018
| 11 | Design a reinforced concrete column to carry an axial load of 1600 kN. Use M20 concrete and Fe415 steel. The column has unsupported length of 3m and is effectively held in position at both the ends, but not restrained against rotation. | KTU,May 2019 |
| 12 | Determine the area of longitudinal steel to be provided in a short column of size 600mm x 600mm subjected to a factored load of 1500 kN. Use M20 concrete and Fe415 steel. | KTU,May 2019 |
| 13 | Sketch the reinforcement detailing of a tread-riser type stair. | KTU,May 2019 |
| 14 | Design and detail a dog-legged stair for a building in which the vertical distance between the floors is 3.6 m. The stair hall measures 2.5 m × 5 m. The live load may be taken as 2500 N/m². Assume that stair is supported at outer edges. Use M20 concrete and Fe415 steel. | KTU,DEC 2019 |
| 15 | Design a circular short column to carry an axial load of 1000 kN using helical reinforcement. Use M20 concrete and Fe 415 steel. | KTU,DEC 2019 |
| 16 | Design a square column to carry a factored axial load of 1500 kN. Use M20 concrete and Fe415 steel. Draw a longitudinal section and a cross section showing the reinforcement. | KTU,Sep 2020 |
| 17 | What are the purposes of lateral ties in a column? | KTU,Sep 2020 |
| 18 | Differentiate between long and short columns. | KTU,Sep 2020 |
| 19 | Draw a typical detailing for tread riser type stair to show all the reinforcement and mark all reinforcement with assumed values. | KTU,Sep 2020 |
| 20 | Design a circular helical reinforced circular column to carry an axial load of 1800 kN. Use M20 and Fe415 | KU, JAN 2018 |
| 21 | Why does the code specify limits to minimum and maximum reinforcements in columns | KU, NOV 2014 |
| 22 | Briefly explain the importance of tranverse reinforcement in the reinforced concrete column | KU, NOV 2011 |
| 23 | Determine the ultimate load carrying capacity of a column of size 400 mmX 400 mm reinforced with 8 nos 16 mm dia with lateral ties and assuming M20 and Fe415 | KU, NOV 2013 |
CE 309 WATER RESOURCE ENGINEERING

Module 1

1. Explain the method of determination of optimum number of rain gauges in a catchment. (KTU SEPTEMBER 2020) – 4 MARKS

2. Compare Thiessen polygon method and isohyetal method for determination of average precipitation over a catchment (KTU SEPTEMBER 2020) – 6 MARKS

3. Explain rainfall mass curve and hyetograph. How will you construct a hyetograph from rainfall mass curve (KTU SEPTEMBER 2020) – 5 MARKS

4. A rain gauge recorded the following accumulated rainfall during a storm. Plot a Hyetograph for the given data. (KTU DECEMBER 2019) – 6 MARKS

<table>
<thead>
<tr>
<th>Time(am)</th>
<th>7.00</th>
<th>7.05</th>
<th>7.10</th>
<th>7.15</th>
<th>7.20</th>
<th>7.25</th>
<th>7.30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accumulated rainfall (mm)</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>7</td>
<td>12</td>
<td>19</td>
<td>20</td>
</tr>
</tbody>
</table>

5. Describe how infiltration rate is measured using Double ring infiltrometer. (KTU DECEMBER 2019) – 5 MARKS

6. What is Recurrence interval? How is it determined? (KTU DECEMBER 2019) – 4 MARKS

7. Describe how evaporation measurement is done using IMD land pan. (KTU DECEMBER 2019) – 6 MARKS
8. Describe the Non recording rain gauge with a neat sketch

(KTU MAY 2019) – 6 MARKS

9. Determine the mean precipitation for the rectangular area given below by Thiessen Polygon method. Precipitation recorded at rain gauge stations A, B, C and D are 15 cm, 10 cm, 12 cm and 16 cm respectively. The distance between the rain gauge stations A and B is 12 km and that between A and D is 7 km.

(KTU MAY 2019) – 5 MARKS

10. The rate of rainfall for successive one hour periods of a 10 hour storm were recorded as 4.0, 6.3, 5.2, 7.5, 8.4, 2.3, 5.4, 4.5, 8.5 and 3.6 cm/hr. Taking value of $\phi$ – index as 6.0 cm/hr, compute i) Total rainfall excess ii) W-index.

(KTU MAY 2019) – 4 MARKS

11. Determine the total infiltration depth for a storm lasting for 5 hours, if the initial infiltration rate is 12 mm/hr, final infiltration rate is 8 mm/hr and constant value describing the rate of decay of the difference between initial and final infiltration rate is 0.82/h.

(KTU MAY 2019) – 5 MARKS

12. In a catchment area, the annual rainfall recorded by rain gauges A, B, C, D, E and F are 52, 63, 35, 56, 40 and 59 cm respectively. For a 10% error in estimation of mean rainfall, calculate the optimum number of rain gauges in the area.

(KTU MAY 2019) – 5 MARKS

13. What are the different types of precipitation?

(KTU MAY 2019) – 4 MARKS
14. The respective storm totals at three surrounding stations A, B and C are 110, 90 and 70 mm. If the normal annual precipitation amounts at stations X, A, B and C are respectively 1000, 1100, 1200 and 1250 mm, estimate the missing storm precipitation at station X using arithmetic mean method and normal ratio method.

(KTU DEC 2018) – 5 MARKS

15. If the value of k in Horton’s equation is 2 and the maximum and minimum infiltration rates observed are 2 cm/hr and 0.5 cm/hr respectively, find the infiltration rates at 30 minutes interval and plot the infiltration rate curve.

(KTU DEC 2018) – 6 MARKS

Module 2

1. A trapezoidal channel of bed width 4 m and side slope 1 : 1 carries water at a depth of 2 m. The rate of evaporation observed was 0.35 mm/m²/h. Find the daily loss due to evaporation from the canal in a length of 10 km in ha m.

(KTU SEPTEMBER 2020) – 5 MARKS

2. Explain the factors affecting runoff from a catchment

(KTU SEPTEMBER 2020) – 10 MARKS

3. Enlist the uses and limitations of unit hydrograph theory

(KTU SEPTEMBER 2020) – 5 MARKS

4. What are the assumptions of Unit hydrograph theory?

(KTU MAY 2019) – 4 MARKS

5. Given below are the ordinates of 4 hr UH of a basin. Derive 2 hr UH of the basin using S-curve method (KTU SEPTEMBER 2020) – 10 MARKS
6. The following are the ordinates of a 6 hour storm hydrograph of a catchment area of 426 hectares. Construct a 6 hour unit hydrograph for the same basin, if constant base flow is 16 cumecs.

<table>
<thead>
<tr>
<th>Time (hrs)</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td>UHO (m³/sec)</td>
<td>0</td>
<td>20</td>
<td>36</td>
<td>60</td>
<td>80</td>
<td>112</td>
<td>120</td>
<td>105</td>
<td>92</td>
<td>40</td>
<td>24</td>
<td>14</td>
<td>9</td>
<td>7</td>
<td>0</td>
</tr>
</tbody>
</table>

(KTU DECEMBER 2019) – 6 MARKS

7. A station ‘A’ was inoperative while stations B, C, D and E registered 80 mm, 70mm, 83 mm and 79 mm of precipitation. Co-ordinates of B, C, D and E are (7, 6), (10, -8), (-11, -5) and (-5, 5) respectively with coordinates of A as (0, 0). Estimate storm precipitation by Inverse distance method.

(KTU DECEMBER 2019) – 5 MARKS

8. A 12 hour storm rainfall with following depths in cm occurs over a basin. 3, 3.4, 8.6, 4.9, 11.5, 5, 3, 11, 5.4, 5.8, 1.6, 1.3. Surface runoff is 20.6 cm. Determine the average infiltration index.

(KTU DECEMBER 2019) – 4 MARKS

9. What is Infiltration? What are the factors affecting Infiltration?

(KTU DECEMBER 2019) – 5 MARKS
10. What is S Hydrograph? How is it used to construct a longer or shorter period hydrograph from a longer period hydrograph?

(KTU DECEMBER 2019) – 4 MARKS

11. The rate of precipitation observed over a catchment of 30km² for successive 30 min are 16, 20, 24, 36, 28, 12 and 4mm/hr. If the φ index is 22mm/hr, find the runoff volume in m³ from the catchment.

(KTU DECEMBER 2018) – 5 MARKS

12. A 6 hr UH ordinates for a basin are given below. Derive the 9 hr UH ordinates using S curve method

(KTU DECEMBER 2018) – 10 MARKS

<table>
<thead>
<tr>
<th>Time (hrs)</th>
<th>0</th>
<th>3</th>
<th>6</th>
<th>9</th>
<th>12</th>
<th>15</th>
<th>18</th>
<th>21</th>
<th>24</th>
<th>27</th>
<th>30</th>
<th>33</th>
<th>36</th>
<th>39</th>
<th>42</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 hr UH O m³/s</td>
<td>0</td>
<td>9</td>
<td>20</td>
<td>35</td>
<td>49</td>
<td>43</td>
<td>35</td>
<td>28</td>
<td>22</td>
<td>17</td>
<td>12</td>
<td>9</td>
<td>6</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

(KTU DECEMBER 2018) – 10 MARKS

Module 3

1. Define Duty and Delta. Obtain the relation between the two

(KTU SEPTEMBER 2020) – 5 MARKS

2. What are the factors affecting Duty of water of a canal system?

(KTU MAY 2019) – 5 MARKS

3. What is Gross Commanded Area, Culturable commanded area and Unculturable commanded area?

(KTU MAY 2019) – 5 MARKS

4. A canal was designed to supply the irrigation needs of 1000 ha of land growing rice of 120 days base period and having a delta of 130 cm. Instead of rice if the canal water is used entirely to irrigate wheat of base period 118
days and having delta of 50 cm, determine the area that can be irrigated by the canal supplies.  

(KTU SEPTEMBER 2020) – 10 MARKS

5. Explain irrigation efficiencies. (KTU SEPTEMBER 2020) – 5 MARKS

6. Explain benefits and ill effects of irrigation

(KTU SEPTEMBER 2020) – 4 MARKS

7. Explain (i) field capacity (ii) permanent wilting point (iii) capillary water

(KTU SEPTEMBER 2020) – 6 MARKS

8. Describe the types of Irrigation. (KTU DECEMBER 2019) – 5 MARKS

9. What is Available moisture and Readily available moisture?

(KTU DECEMBER 2019) – 4 MARKS

10. What is Meandering of rivers? (KTU DECEMBER 2019) – 4 MARKS

11. Determine the reservoir capacity ,if culturable commanded area is 5200 ha, canal losses are 20% and reservoir losses are 15%

12. A crop grown in an area of 5000 ha is fed by a canal system. Find daily consumptive use and discharge in m3/s required in the area if,

Field capacity of soil = 28%

<table>
<thead>
<tr>
<th>Crop</th>
<th>Base period(days)</th>
<th>Duty at field (ha/cumecs)</th>
<th>Intensity of Irrigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td>120</td>
<td>1700</td>
<td>20%</td>
</tr>
<tr>
<td>Sugarcane</td>
<td>320</td>
<td>1400</td>
<td>20%</td>
</tr>
<tr>
<td>Cotton</td>
<td>180</td>
<td>1200</td>
<td>10%</td>
</tr>
<tr>
<td>Rice</td>
<td>120</td>
<td>700</td>
<td>15%</td>
</tr>
</tbody>
</table>

(KTU DECEMBER 2019) – 6 MARKS
Optimum moisture = 10%
Permanent wilting point = 8%
Effective depth of root zone = 70 cm
Relative density of soil = 1.3

(KTU DECEMBER 2019) – 4 MARKS

13. A stream of 120 litre/s was diverted from a canal and 100 litre/s were delivered in the field. An area of 2 hectares was irrigated in 10 hours. The runoff loss in the field was 420 m³ Effective depth of root zone was 1.5 m. Determine Water conveyance efficiency and Water application efficiency.

(KTU MAY 2019) – 5 MARKS

14. What is Consumptive use of water? List the methods by which it is determined?

(KTU MAY 2019) – 4 MARKS

Module 4

1. Explain the classification of river training.

(KTU SEPTEMBER 2020) – 3 MARKS

2. List the objectives of river training. Discuss repelling, attracting and deflecting groynes.

(KTU DECEMBER 2018) – 5 MARKS

3. The data pertaining to a stream gauging operation at a gauging station are given below. The rating equation of the current meter is

\[ v = 0.51N_s + 0.03 \text{ m/sec} \]

where \( N_s \) is the number of revolutions per second. Calculate the discharge in the stream.
4. Describe the use of current meter in measuring velocity of a river.  
(KTU DECEMBER 2019) – 6 MARKS

5. Describe the Area Velocity method used for stream discharge measurement. 
(KTU DECEMBER 2019) – 5 MARKS

6. What is a Guide bank system?  
(KTU DECEMBER 2019) – 5 MARKS

7. What is Stream Gauging? What are the factors to be considered while selecting a Stream gauging site?  
(KTU MAY 2019) – 6 MARKS

8. What is a Stage – Discharge curve?  
(KTU MAY 2019) – 5 MARKS

9. With the help of sketches, describe briefly the various methods of river training works- 12 marks

10. The current meter readings taken during gauging of a stream are given in the table below. The current meter rating is given as $v=0.05 + 0.3N$, $v$ in m/s and $N$ in rev/s. Compute the discharge in the stream.  
(KTU DECEMBER 2018) – 6 MARKS

<table>
<thead>
<tr>
<th>Distance from left water edge (m)</th>
<th>0</th>
<th>1</th>
<th>3</th>
<th>5</th>
<th>7</th>
<th>9</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth (m)</td>
<td>0</td>
<td>1.1</td>
<td>2</td>
<td>2.5</td>
<td>2</td>
<td>1.7</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Revolutions of current meter kept at 0.6 depth</td>
<td>0</td>
<td>39</td>
<td>58</td>
<td>112</td>
<td>90</td>
<td>45</td>
<td>30</td>
<td>0</td>
</tr>
<tr>
<td>Duration of observation (s)</td>
<td>0</td>
<td>100</td>
<td>100</td>
<td>150</td>
<td>150</td>
<td>100</td>
<td>100</td>
<td>0</td>
</tr>
</tbody>
</table>
Module 5

1. Define safe yield and average yield of reservoirs.

   (KTU SEPTEMBER 2020) – 4 MARKS

2. Explain the method of determination of yield of reservoirs with a given capacity.

   (KTU SEPTEMBER 2020) – 4 MARKS

3. A reservoir has a capacity of 3.6 Mha-m up to the level of the spillway crest. The average annual inflow is 1.5 Mha-m of water. If the average annual sediment inflow is $3 \times 10^{11}$ kg, determine the useful life of the reservoir assuming that the usefulness of the reservoir is terminated when 2/3 of the total capacity is filled with sediments. Assume suitable value for specific weight of sediment.

   (KTU SEPTEMBER 2020) – 12 MARKS

4. What are the zones of a storage reservoir?

   (KTU DECEMBER 2019) – 6 MARKS

5. What are the types of Dam Reservoirs?

   (KTU DECEMBER 2019) – 6 MARKS

6. Describe the use of Mass Inflow curve to determine capacity of a reservoir.

   (KTU DECEMBER 2019) – 8 MARKS

7. What are the factors affecting selection of site for a reservoir?

   (KTU MAY 2019) – 8 MARKS
8. What are the methods adopted for controlling silting of a reservoir?

(KTU MAY 2019) – 6 MARKS

9. Explain the procedure to calculate the Life of a reservoir.

(KTU MAY 2019) – 6 MARKS

10. What is Trap efficiency? What is its significance?

(KTU DECEMBER 2019) – 6 MARKS

11. The following information is available regarding the relationship between trap efficiency and capacity inflow ratio for a river. Find the probable life of the reservoir with an initial reservoir capacity of 30 million cubic meters if the annual flood inflow is 60 million cubic meters and the average annual sediment inflow is 3600000KN. Assume a specific weight of sediment equal to 12KN/m2. The useful life of the reservoir will terminate when 80% of initial capacity is filled with sediment

<table>
<thead>
<tr>
<th>Capacity in flow ratio</th>
<th>0.1</th>
<th>0.2</th>
<th>0.3</th>
<th>0.4</th>
<th>0.5</th>
<th>0.6</th>
<th>0.7</th>
<th>0.8</th>
<th>0.9</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trap efficiency</td>
<td>87</td>
<td>93</td>
<td>95</td>
<td>95.5</td>
<td>96</td>
<td>96.6</td>
<td>97</td>
<td>97.2</td>
<td>97.3</td>
<td>97.5</td>
</tr>
</tbody>
</table>

(KTU DECEMBER 2017) – 10 MARKS

Module 6

1. Stating the assumptions underlying it, derive the Dupuit’s equation for steady radial flow into unconfined aquifers.

(KTU SEPTEMBER 2020) – 10 MARKS

2. During a recuperation test conducted on an open well in a region, the water level in the well was depressed by 3 m and it was observed to rise by 1.75 m in 90 minutes. (a) What is the specific yield of open wells in that region (b) What will be the yield from a well of 5 m diameter under a depression head of 2.5 m?

(KTU SEPTEMBER 2020) – 10 MARKS
3. Describe the vertical distribution of ground water.  

(KTU SEPTEMBER 2020) – 5 MARKS

4. Differentiate (i) open well and tube well (ii) flowing well and artesian well  
(KTU SEPTEMBER 2020) – 6 MARKS

5. A 30 cm diameter well completely penetrates a confined aquifer of permeability of 45 m/day. The length of the strainer is 20 m. Under steady state of pumping, the drawdown at the well was found to be 3 m, and the radius of influence was 300 m. Calculate the discharge. If the diameter of well is increased by 50 %, what will be the percentage increase in discharge?  
(KTU SEPTEMBER 2020) – 9 MARKS

6. Describe the tests to determine the yield of a well.  

(KTU DECEMBER 2019) – 8 MARKS

7. A gravity well has a diameter of 65 cm. The depth of water in the well is 45 m before pumping has started. When pumping is done at the rate of 40 litres/s, the drawdown in a well 12 m away is 4.5 m and in another well, 24 m away, the drawdown is 3m. Determine i) Radius of zero drawdown ii) Coefficient of permeability iii) Drawdown in the well iv) Maximum rate at which water can be discharged from the well.  
(KTU DECEMBER 2019) – 8 MARKS

8. During a Recuperation test, water in an open well was depressed by pumping by 3 metres and it recuperated 2 metres in 75 minutes. Find i) Yield from a well of 4m diameter under a depression head of 4 metres ii) Diameter of the well to yield 600 litres/minute under a depression head of 2.5 metres.  
(KTU DECEMBER 2019) – 6 MARKS
9. Define i) Coefficient of Transmissibility ii) Storage coefficient  
   (KTU DECEMBER 2019) – 3 MARKS

10. Describe the types of Tube wells?  
    (KTU MAY 2019) – 8 MARKS

11. What is a confined aquifer? Derive an expression to obtain the discharge through a confined aquifer.  
    (KTU MAY 2019) – 6 MARKS

12. A recuperation test in an open well yielded the following water levels: Initial water table level – 250.00m; water table level when pumping was stopped – 243.00m; water table level in well 2hr after pumping was stopped – 245.00mFind the safe yield of the well if working head is 3m.  
    (KTU DECEMBER 2018) – 7 MARKS

13. A well is to be constructed in a fine sandy subsoil formation. The discharge of the well is anticipated to be 0.004 m³/s under depression head of 4 m. Find the diameter of the well. Given (K/A) for sandy soil = 0.5 m³/hr/m² of area under depression head of 1 m.  
    (KTU APRIL 2018) – 7 MARKS

14. Explain with sketch strainer type tube well.  
    (KTU APRIL 2018) – 7 MARKS

15. Derive an expression for the yield of an open well using Recuperation test  
    (KTU DECEMBER 2017) – 10 MARKS

16. Define Porosity, specific yield, specific retention. Write the relation between them.  
    (KTU DECEMBER 2018) – 10 MARKS
Module -I

1. Briefly explain about various methods of Traversing? 10 marks (KTU 2019 Dec)
2. Explain about the checks which can be applied in traverse surveying? 10 marks (KTU 2019 July)
3. Distinguish between Latitude and Departure? 5 marks (KTU 2018 Dec)
4. Briefly explain about balancing the traverse? 15 marks (KTU 2019 July)
5. Compare the traversing by fast needle method and loose needle method? 5 marks (KTU 2020 Sep)
6. The following are the length and magnetic bearings of the sides of a traverse ABCD. Find the errors of closure. 15 marks (KTU 2019 Dec)

<table>
<thead>
<tr>
<th>Line</th>
<th>Length in m</th>
<th>Bearing</th>
</tr>
</thead>
<tbody>
<tr>
<td>AB</td>
<td>420</td>
<td>340°52'</td>
</tr>
<tr>
<td>BC</td>
<td>740</td>
<td>85°40'</td>
</tr>
<tr>
<td>CD</td>
<td>530</td>
<td>170°40'</td>
</tr>
<tr>
<td>DE</td>
<td>660</td>
<td>265°12'</td>
</tr>
</tbody>
</table>

7. The consecutive coordinates of a theodolite traverse ABCDEA are given below. Balance the traverse and find the adjusted values and independent coordinates, assuming that those of A are (200N, 100 E) 15 marks (KTU sep 2020)

<table>
<thead>
<tr>
<th>Line</th>
<th>Latitude</th>
<th>Departure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>S</td>
</tr>
<tr>
<td>AB</td>
<td>21.98</td>
<td></td>
</tr>
<tr>
<td>BC</td>
<td>82.69</td>
<td></td>
</tr>
<tr>
<td>CD</td>
<td>41.57</td>
<td>13.48</td>
</tr>
<tr>
<td>DE</td>
<td>13.54</td>
<td>36.04</td>
</tr>
<tr>
<td>EA</td>
<td>115.33</td>
<td>22.36</td>
</tr>
</tbody>
</table>

8) Calculate the offset at 25m intervals along the tangents to locate a curve of radius 500m by methods of i) radial offset ii) perpendicular offset. 8 marks (KTU sep 2020)

9) Detail the steps in the setting out of a compound curve by deflection angle
10) Explain direct method without transiting in fast needle method of traversing with the help of suitable sketch. 7 marks (KTU Sep 2020)

11) A man travels from a point A, to west direction and reaches point B after 139.6m. Find the latitude and departure of line AB 5 marks (KTU dec 2019)

**MODULE -II**

1) List the various types of curves. Types of curves: 10 marks (KTU Sep 2020)

2) What are the three classes of circular curves? 10 marks (KTU July 2019)

3) What are the elements of a simple Circular curve? 8 marks (KTU dec 2019)

4) Define: Setting out of curves (curve ranging). What are the methods used for setting curves? 10 marks( KTU Sep 2020)

5) Define: transition curve. 15 marks( KTU dec 2018)

6) What are the functions of a transition curve? What are the types of transition curve? 15 marks (KTU Sep 2020)

7) Explain the various methods of determining the length of a transition curve 20 marks( KTU Jul 2019)

8) What are the difficulties in setting out simple curves? Describe briefly the methods employed in overcoming them. 20 marks (KTU dec 2018)

9) Briefly explain reverse curves and shift of a transition curve. 10 marks (KTU Sep 2020)

10) Explain the elements of a compound circular curve 10 marks (KTU July 2019)

11) Explain Rankine’s method for setting out simple circular curve. 10 marks (KTU Dec 2019)

12) Explain how you arrive at the length of transition curve based on rate of change of radial acceleration. 5 marks( Dec 2019)

**MODULE –III**


2. What you mean by Global Positioning System, (KTU July 2019)

3. Explain errors in GPS ranging, Explain any two in detail 10 marks( KTU dec 2020)

4. Briefly explain about the various applications of GPS 10 marks (KTU sep 2020)

5. Explain the principle of position determination by satellite ranging 20 marks
6. Explain about the principles of GPS? 15 marks (KTU sep 2019)
7. List the advantages and disadvantages of GPS surveying methods 15 marks (KTU Dec 2019)

MODULE –IV

1. Explain static and rapid static methods of GPS surveying 20 marks (KTU sep 2019)
2. What you mean by visibility diagram? Illustrate with sketch marks (KTU Dec 2019)
3. What is meant by DGPS? Explain code based and carrier based DGPS system marks (KTU July 2019)
4. Explain briefly about various phases of GPS survey? marks (KTU sep 2019)
5. How does satellite geometry affect the accuracy of GPS? 5 marks (KTU July 2019)
6. Explain the phases of GPS surveying. marks (KTU Dec 2020)
7. Enumerate the applications of GPS. marks (KTU Dec 2020)

MODULE –V

1. What is meant by multi spectral scanning? 5 marks (KTU sep 2020)
2. Explain along track and across track scanning? 10 marks (KTU sep 2020)
3. What is meant by remote sensing? 5 marks (KTU sep 2019)
4. Describe the principles of remote sensing? 5 mark (KTU sep 2019)
5. Explain passive and active remote sensing? 15 marks (KTU July 2019)
6. What is meant by spectral reflectance? Explain the reflectance characteristics of soil, vegetation and water with the help of spectral reflectance curve?  
20 marks (KTU Dec 2018)

7. Illustrate the effect of EM energy interactions with the earth’s surface  
15 marks (KTU Dec 2018)

8. Distinguish between temporal and radiometric resolution.  
10 marks (KTU sep 2019)

9. List out the applications of remote sensing.  
20 marks (KTU sep 2019)

**MODULE –VI**

1. a. Briefly explain about Geographic information system and its applications  
10 marks (KTU sep 2019)

   b. Describe the various components of GIS?  
10 marks (KTU sep 2019)

2. a. Write short notes on spatial data and attribute data?  
7 marks (KTU Dec 2019)

   b. Explain geographic coordinate system and projected coordinate system?  
15 marks (KTU dec 2019)

3. Explain Mercator projections; write down its properties and limitations?  
20 marks (KTU July 2019)

4. List down the types of map projections according to the projection surface. Explain any two with sketches?  
20 marks (KTU dec 2020)

5. Briefly explain about any two vector data analysis?  
20 marks (KTU Dec 2020)
| 1 | How the biosphere is linked to other spheres of the environment? | 5 | KTU DEC 2017 |
| 2 | The nitrogen cycle is of particular interest to ecologists. Why? | 5 | KTU DEC 2017 |
| 3 | ‘Genetics loads the gun, but environment pulls the trigger’. How far this statement is true for the people living in adverse environmental conditions. | 5 | KTU DEC 2017 |
| 4 | (a) Explain the multidisciplinary nature with help of flow chart | 5 | KTU DEC 2018 |
| 5 | Write short note on population explosion. | 7 | KTU DEC 2018 |
| 6 | The industrial developments have caused positive as well as negative effects on human health-Give relevant comments. | 8 | KTU DEC 2018 |
| 7 | What is ozone hole? What are the causes of ozone hole formation? Discuss effects of ozone layer depletion and its remedial measures | 7 | KTU DEC 2018 |
| 8 | How do the carbon levels in the environment maintain a rough stability without human influence? | 5 | KTU MAY 2019 |
| 9 | How does the stack gases from a thermal power plant located on the sea coast behave during day and night time? | 5 | KTU MAY 2019 |
| 10 | How do suspended particulate matters present in air affect human beings, plants and materials? | 5 | KTU MAY 2019 |
| 11 | Give the list of pollutants emitted from (i) non metallic industry (ii) iron and steel industry (iii) thermal power plants (iv) cement industry and (v) oil refineries. | 5 | KTU DEC 2019 |
| 12 | Name the major global environmental issues faced by today’s world and how do they affect the stability of the environment. | 5 | KTU DEC 2019 |
# MODULE II

<table>
<thead>
<tr>
<th></th>
<th>Question</th>
<th>Marks</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>What are air quality standards? Differentiate (i) ambient air quality and emission standards</td>
<td>5</td>
<td>KTU DEC 2017</td>
</tr>
<tr>
<td>2</td>
<td>Most of the air pollution hazards occurred during winter. State the reason for this.</td>
<td>3</td>
<td>KTU DEC 2017</td>
</tr>
<tr>
<td>3</td>
<td>Define ambient air quality standards</td>
<td>5</td>
<td>KTU DEC 2017, DEC 2018</td>
</tr>
<tr>
<td>4</td>
<td>How air pollution is classified based on origin and mode of release of pollutants to atmosphere?</td>
<td>5</td>
<td>KTU DEC 2017</td>
</tr>
<tr>
<td>5</td>
<td>Give a detailed account of the impact of air pollutants on materials.</td>
<td>5</td>
<td>KTU DEC 2017</td>
</tr>
<tr>
<td>6</td>
<td>Write a note on source and effects of particulate air pollutants mentioning their chemical composition</td>
<td>7</td>
<td>KTU DEC 2018</td>
</tr>
<tr>
<td>7</td>
<td>What is photochemical smog? How it is formed and what are its impacts?</td>
<td>5</td>
<td>KTU MAY 2019</td>
</tr>
<tr>
<td>8</td>
<td>Enlist the different source correction methods used by industries to control air pollution</td>
<td>5</td>
<td>KTU MAY 2019</td>
</tr>
<tr>
<td>9</td>
<td>Differentiate between (i) radiation inversion and subsidence inversion (ii) primary air quality standard and secondary air quality standard</td>
<td>5</td>
<td>KTU MAY 2019</td>
</tr>
<tr>
<td>10</td>
<td>What is smog? Why does Delhi have so much smog in recent years?</td>
<td>5</td>
<td>KTU DEC 2019</td>
</tr>
<tr>
<td>11</td>
<td>How do air pollutants affect the plants and animals?</td>
<td>4</td>
<td>KTU DEC 2019</td>
</tr>
<tr>
<td>12</td>
<td>How do atmospheric stability conditions affect the behaviour of plume released from stacks?</td>
<td>5</td>
<td>KTU DEC 2019</td>
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# MODULE III

<table>
<thead>
<tr>
<th></th>
<th>Question</th>
<th>Marks</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>How eutrophication of water bodies lead to extinction of bird species?</td>
<td>4</td>
<td>KTU DEC 2017, DEC 2018</td>
</tr>
<tr>
<td>2</td>
<td>Most of the fish killings in receiving water bodies are reported during summer season. Why?</td>
<td>4</td>
<td>KTU DEC 2017</td>
</tr>
<tr>
<td></td>
<td>Question</td>
<td>Marks</td>
<td>Date</td>
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<td>---</td>
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<tr>
<td>3</td>
<td>What are water-borne diseases? Name any three causative agents with the diseases caused.</td>
<td>4</td>
<td>KTU DEC 2017</td>
</tr>
<tr>
<td>4</td>
<td>What is meant by water quality standards? For what all purposes they are laid.</td>
<td>4</td>
<td>KTU DEC 2017</td>
</tr>
<tr>
<td>5</td>
<td>Give the environmental significance of DO and BOD.</td>
<td>8</td>
<td>KTU DEC 2018</td>
</tr>
<tr>
<td>6</td>
<td>Explain about pollutants of water</td>
<td>7</td>
<td>KTU DEC 2018</td>
</tr>
<tr>
<td>7</td>
<td>Give the source and impact of the following heavy metals in aquatic ecosystem. (i) lead (ii) cadmium and (iii) mercury</td>
<td>6</td>
<td>KTU MAY 2019</td>
</tr>
<tr>
<td>8</td>
<td>What are waterborne diseases? Give any three causative agents with the diseases caused.</td>
<td>4</td>
<td>KTU MAY 2019</td>
</tr>
<tr>
<td>9</td>
<td>Synthetic organic compounds are considered as water pollutants. What are the adverse impacts of these compounds on aquatic ecosystem?</td>
<td>4</td>
<td>KTU MAY 2019</td>
</tr>
<tr>
<td>10</td>
<td>What are the impacts when waste water with high BOD is discharged to water bodies?</td>
<td>4</td>
<td>KTU DEC 2019</td>
</tr>
<tr>
<td>11</td>
<td>In the recent flooding events of Kerala, large number of motor vehicles and electronic equipments were drowned. Discuss about the probable pollutants that would have caused pollution of water resources due to the disaster.</td>
<td>5</td>
<td>KTU DEC 2019</td>
</tr>
<tr>
<td>12</td>
<td>What is the intention of providing water quality standards? Give the names of any three authorised bodies who prescribe standards for potable water.</td>
<td>5</td>
<td>KTU DEC 2019</td>
</tr>
<tr>
<td>Module IV</td>
<td>Question</td>
<td>Marks</td>
<td>Year</td>
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<td>--------------------------------------------------------------------------</td>
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<tr>
<td>1</td>
<td>(a) What is municipal solid waste? Give the composition of a typical Indian municipal solid waste.</td>
<td>15</td>
<td>KTU DEC 2017</td>
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<tr>
<td></td>
<td>(b) What is segregation of solid waste? Under what circumstance it is recommended</td>
<td></td>
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<tr>
<td></td>
<td>(c) What is recycling of waste material? Give the steps involved in recycling of plastic</td>
<td></td>
<td></td>
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<tr>
<td>2</td>
<td>(a) List the physical, chemical and biological characteristics of municipal solid waste</td>
<td>7</td>
<td>KTU DEC 2017</td>
</tr>
<tr>
<td></td>
<td>(b) What is e-waste? Why it should be source separated?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>(a) Explain the segregation of solid waste</td>
<td>15</td>
<td>KTU DEC 2018, MAY 2019</td>
</tr>
<tr>
<td></td>
<td>(b) Differentiate the composition of MSW in urban areas and industrial solid waste.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(c) Define e-waste. What are the sources of generation of e-waste?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>(a) Re-cycling is an integral part of solid waste management. Comment</td>
<td>10</td>
<td>KTU DEC 2018</td>
</tr>
<tr>
<td></td>
<td>(b) Give the different methods available for solid waste disposal. Mention the advantages and disadvantages of land filling.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Give an account on the 5R principle in solid waste management</td>
<td>5</td>
<td>KTU MAY 2019</td>
</tr>
<tr>
<td>6</td>
<td>E-waste related toxic effects can be exacerbated throughout a person’s lifetime and across generations. How?</td>
<td>5</td>
<td>KTU MAY 2019</td>
</tr>
<tr>
<td>7</td>
<td>What is meant by sanitary land filling? What are its advantages and disadvantages?</td>
<td>5</td>
<td>KTU DEC 2019</td>
</tr>
</tbody>
</table>
Informal sector e-waste activities are becoming a crucial source of environment to food-chain contamination. How?

**MODULE V**

| 1 | (a) What is land degradation? What are the main causes?  
(b) How the pesticides applied to agricultural land do reach human body and what are the health impacts due to them?  
(c) What is integrated pest management technique? How is it achieved? | 20 | KTU DEC 2017 |
<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>(a) Air pollution is also a reason for soil pollution. How this happens</td>
<td>5</td>
<td>KTU DEC 2017</td>
</tr>
</tbody>
</table>
| 3 | (a) List the effects of urbanization in soil degradation  
(b) How sound insulation can be done during construction stage of a building?  
(c) What are wastelands and wetlands? | 20 | KTU DEC 2018 |
| 4 | (a) What are the direct and indirect effects on soil quality due to excessive and intensive irrigation practices?  
(b) Can urbanisation cause land degradation through climate changes? Justify your answer.  
(c) What is meant by organic farming? What are its advantages? | 20 | KTU MAY 2019 |
5. (a) What is meant by soil acidification? How does it affect agricultural productivity and sustainable farming systems?
   (b) Mining and its subsequent activities have been found to degrade the land to a significant extent. Suggest suitable control measures for this.

6. (a) How is land degradation linked to water logging? How can this be prevented?
   (b) Suggest safe and environment-friendly methods to clean up polluted soil.
   (c) What are bio-pesticides? How do they achieve pest management in an environment-friendly manner?

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**MODULE VI**

1. (a) Define sound pressure, sound intensity and frequency of sound. What are the units used for their measurement.
   (b) What is sonic boom? How it is caused?
   (c) How industrial noise is causing occupational hazard? What are the control measures?

2. a. A fluctuating noise level is composing of a sound of 80 dB lasting for 10 minutes, followed by a sound of 60 dB lasting for 80 minutes and then followed by
<p>| | | |</p>
<table>
<thead>
<tr>
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</thead>
</table>
| 3 | (a) List out the major sources of soil pollution and explain any five.  
(b) Discuss about the measurement of sound
(c) What are the physical and psychological effects of noise. | 20 | KTU DEC 2018 |
| 4 | Define a) Pitch  
b) Sound pressure level | 5 | KTU DEC 2018 |
| 5 | a. What are the basic sound absorption technologies used for noise reduction in buildings?  
(b) What is meant by occupational hearing loss? How this is prevented | 10 | KTU MAY 2019 |
| 6 | (a) Enlist the various non-industrial sources of noise with their typical noise levels  
(b) What are weighting networks in sound level meters? Mention the different types and importance of each weighting network  
(c) How noise is controlled at the source of generation? | 20 | KTU MAY 2019 |
| 7 | (a) Differentiate between (i) sound power level and sound intensity (ii) intermittent noise and impulse noise (iii) sound pressure level and sound pressure  
(b) What are the components of a sound | 20 | KTU DEC 2019 |
level meter? Mention the function of each component

(c) Is urban planning effective in controlling noise pollution? Justify your answer
**DISASTER MANAGEMENT CE369 (S5CE)**

**MODULE 1**

a. Give the classification of different types of Disasters. (5 marks GTU 2018)
b. Describe natural disasters and man-made disasters. (5 marks GTU 2016)
c. What is the role of GIS in Disaster management? (10 marks GTU 2016)

2. a. Explain structural and nonstructural mitigation of disasters. (10 marks GTU 2015)
b. What do you mean by Human Induced Disasters? (10 marks)

3. a. Explain in brief the causes of climate change? (12 marks GTU 2016)
b. What do you mean by vulnerability? (8 marks GTU 2016)

4. a. What is remote sensing and how it is useful in Disaster management? (10 marks GTU 2016)
b. Explain the relationship between disaster and sustainable development. (10 marks KTU 2018)

5. a. What do you mean by Risk in Disaster Management? (10 marks GTU 2016)
b. What is the importance of crisis management in disaster management. (10 marks KTU 2018)

6. a. Explain the prevention of Biological Disasters. (10 marks GTU 2017)
b. Explain Disaster Management Cycle? (10 marks GTU 2017)

7. a. Explain the term Hazard and its characteristics? (10 marks GTU 2016)
b. Explain Disaster Mitigation Planning. (10 marks)

8. a. Explain the following terms: Preparedness, mitigation and risk mapping. (10 marks GTU 2017)
b. Explain differences between hazards and disasters. (10 marks KTU 2018)

9. a. Explain differences between disasters and hazards. (8 marks KTU 2019)
b. Define the terms risks, vulnerability and risks. (7 marks KTU 2019)

**MODULE 2**

1. a. How will you classify earthquake. Explain in detail. (10 marks)
7. b. Explain the mechanism of origin of earthquake. (10 marks KTU2018)

2. a. Magnitude and intensity of earthquake are important in seismic disaster management. How? (10 marks KTU 2018)

b. Explain continental drift theory. (10 marks)

3. What are the effects of earthquake? (10 marks)

4. How will you classify landslide? Explain in detail. (20 marks KTU2018)

5. What is the impact of landslide on streams? (20 marks)

6. Explain the relationship between earthquakes and tsunamis. (20 marks KTU2018)

7. a. Explain the mechanism of origin of earthquakes. (10 marks KTU2018)

b. Enlist losses due to earthquake. (10 marks GTU2018)

8. a. Explain the concept of Green house effect. (7.5 marks KTU2019)

b. What is Global warming and what are the main causes of global warming. (7.5 marks KTU2019)

9. a. Write a short note on the impact of earthquakes. (7.5 marks KTU2019)

b. Explain the term vulnerability with respect to earthquakes. (7.5 marks KTU2019)

MODULE 3

1. Give adverse effects of tsunami. Also discuss the tsunami mitigation measures. (20 marks)

2. a. How are cyclone prevention and mitigation taken in India? (10 marks)

b. What are the losses due to flood? (10 marks GTU2018)

3. Write short notes on the mitigation measures to be adopted in the case of floods. (20 marks KTU2018)

4. a. Write a short note on prevention of flood. (10 marks)

b. What are the conditions favorable for tropical cyclones? (10 marks KTU2018)

5. a. Explain types of cyclone. (10 marks)

b. Describe initial development stage of Cyclone and mature tropical Cyclone. (10 marks GTU2017)

6. a. What are the characteristics of tropical cyclones? (10 marks KTU2018)

b. Explain the probable impacts of Cyclone. (10 marks KTU2018)

7. a. Write a shortnote on formation of cyclone. (10 marks)

b. What are the impacts of cyclones in INDIA? (10 marks)


b. Why Tsunamis become disastrous when they approach coastal regions. (6 marks KTU2019)

c. How will you assess the vulnerability of a coast to the attack of Tsunamis? (5 marks KTU2019)

9. a. List any 5 probable impacts of cyclones. (5 marks KTU2019)

b. Explain the origin of cyclones. (4 marks KTU2019)

c. Explain any one application of technology in cyclone disaster management. (6 marks KTU2019)
**MODULE 4**

1. a. Describe the types of soil degradation? (10 marks)
   
   b. What are the effects of desertification? (10 marks)

2. a. Outline the reasons for desertification? (10 marks KTU2018)
   
   b. What are the solutions for soil degradation? (10 marks)

3. a. What are the effects of soil degradation? (10 marks)
   
   b. What are the solutions for desertification? (10 marks)

4. a. Mention the reasons and impacts of the salination of soil. (10 marks KTU 2018)
   
   b. Explain the engineering measures to be adopted in the mitigation of soil erosion. (20 marks KTU2018)

5. a. How do soils originate? (4 marks KTU2019)
   
   b. What is soil degradation? (5 marks KTU2019)
   
   c. Explain the impacts of addition of e-waste to soils. (6 marks KTU2019)

**MODULE 5**

1. a. What are the sources of water pollution? (10 marks KTU2018)
   
   b. What are the causes of water pollution? (10 marks)

2. a. How will you prevent water pollution? (10 marks)
   
   b. What are the causes of atmospheric pollution? (10 marks)

3. a. Explain the impacts of air pollution. Give details of different air pollutants. (10 marks KTU2018)
   
   b. How will you prevent air pollution? (10 marks)

4. Write a short note on Green House effect and global warming. (20 marks KTU2018)

5. Explain the impacts of air pollution. Give details of different air pollutants. (20 marks KTU2018)

6. a. What is water pollution. Briefly explain. (2 marks KTU2019)
   
   b. List out the major causes of water pollution and describe. (8 marks KTU2019)
   
   c. Explain the ‘point sources’ and ‘non-point sources’ of pollution with an example. (6 marks KTU2019)
   
   d. List out the major water pollutants. (4 marks KTU2019)

7. a. What is air pollution? (2 marks KTU2019)
   
   b. Discuss the major causes of air pollution. (6 marks KTU2019)
   
   c. What are the classification of air pollutants? Explain with example. (6 marks KTU2019)
   
   d. Describe the impacts of air pollution. (6 marks KTU2019)

**MODULE 6**

1. What are the crisis management plans for floods? (20 marks KTU2018)

2. Outline the stages involved in the crisis management for floods. (20 marks KTU2018)
3. Explain the impacts of influx of tidal waves and explain how to manage them. (20 marks KTU2018)

4. What are the hazard management plans for cyclones? (20 marks)

5. What are the hazard management plans for tidal waves? (20 marks)

6. How will you formulate the mitigation plans for cyclones? (20 marks KTU2018)

7. a. Write a short note on flood forecasting. (5 marks KTU2019)
    b. What are the mitigation measures for flood disaster? (8 marks KTU2019)
    c. What are the impacts of a cyclone? (7 marks KTU2019)
1. (a) What are the assumptions made in Boussinesq’s formula for stress distribution? *(KU, Dec 2009)*(5)
   (b) Explain the use of Newmark’s chart?*(5)
   (c) What are the limitations of Boussinesq’s formula? *(5)*

2. (a) Two columns A and B are located 6m apart. Column A transfers a load of 500KN and column B a load of 259KN. Determine the resultant vertical stress on a horizontal plane 20m below the ground surface at a point vertically below A and B? *(KU Dec 2013)*(10)
   (b) Write down the expression for vertical stress below the center of circular loaded area and explain the terms?*(5)*

3. (a) Plot the variation of vertical stress beneath the center of a strip footing of 3m width which carries a uniform pressure of 140kPa. *(KU Dec 2013)*(8)
   (b) Differentiate between pressure bulb and isobar? *(7)*

4. (a) A circular footing of diameter 3m is subjected to a uniform pressure of 200 kPa. Compute the depth beneath the center of the loaded area at which vertical stress would reduce to 20kPa *(KTU Dec 2017)*(15)

5. (a) Describe the method of calculating the stress at a point below the corner of a rectangular load. How is this method used for points other than that below the corner? *(KTU Dec 2017)* *(8)*
   (b) Define the pressure bulb? What is it significance?*(7)*

6. (a) A rectangular raft of 30x 12m founded on a ground surface is subjected to a uniform pressure of 150kPa. Assume the centre of the area is the origin of coordinates (0, 0) and the corners have coordinates (6, 15). Calculate the stress at a depth of 20m by equivalent point load. Use Boussinesq’s theory, at the coordinates of (0, 0) and (6, 15). *(KTU Dec 2017)* *(15)*

7. (a) Write down the expression for a vertical stress below the center of a strip load?*(3)*
   (b) Draw the isobar of strip loaded area? *(KTU Dec 2019)* *(4)*
   (c) The base of the tower consists of an equilateral triangular frame, on the corners of which the 3 legs of the tower is supported. The total weight of tower is 600KN which is equally carried by 3 legs. Compute the increment in the vertical stress in the soil caused at a point 5m below one of the leg? *(8)*
MODULE 2

1. (a) Explain active and passive states of plastic equilibrium. Give any one practical example of each of these(KU Dec 2013)(5)
   (b) Draw a Mohr’s circle for active and passive earth pressure? (5)
   (c) What is the effect of surcharge on depth of tension crack in case of a retaining wall with purely cohesive backfill? Explain? (5)

2. (a) Differentiate between Rankin’s and Columb’s theory of lateral earth pressure? (KTU Dec 2017 SCHEME)(8)
   (b) What is lateral earth pressure coefficient? Write down the expression for lateral earth pressure coefficient in at rest, passive and active case? Explain each term? (7)

3. Determine the total lateral earth pressure in the case of a 6m high retaining wall carrying a uniform surcharge of 14kPa, for the soil data given below. Upper stratum: cohesion = 16kPa, angle of internal friction = 30°. Unit weight of soil = 16kN/m3, Thickness = 2m Lower stratum; angle of internal friction = 40°. Unit weight of soil above water table =18kN/m3, saturated unit weight of soil 20kN/m3. Water table is at a depth of 4m below the surface of backfill. Assume that tension cracks are not likely to develop (KTU Dec 2018) (15)

4. Compute the total lateral earth thrust exerted by a layered backfill of height 10m if the wall has a tendency to move towards backfill. The upper layer of thickness 6m has angle of internal friction 32° and saturated unit weight 18kN/m3 The lower layer has angle of internal friction 28°, cohesion 20kPa, and saturated unit weight 19kN/m3. The backfill also supports a uniform surcharge of intensity 8kN/m2 Water table is at a depth of 5m below the surface of the backfill. Also find the point of application. (KTU Dec 2018) (15)

5. A wall of 8m height retains a non-cohesive backfill of dry unit weight 18kN/m3 and φ =30°. Using Rankine’s theory find the total active thrust on the wall and the point of application if it carries a uniform surcharge load of 10kPa. (KTU Dec 2019) (15)

6. (a) What is the effect of tension crack in earth pressure of cohesive backfill?(5)
   (b) What are the assumptions of Rankin’s earth pressure theory?(5)
   (c) What are the Assumptions of Columb’s wedge theory? (KTU Dec 2019) (5)
1. (a) What are the assumptions in Terzaghi’s bearing capacity theory\( (10) \)
   (b) Differentiate between general and local shear failure of soil. \( (KTU \ Dec \ 2017)(5) \)

2. (a) A square footing of \( 2 \times 2 \)m is provided at a depth of \( 1 \)m, in a sandy soil with an angle of internal friction of \( 30^\circ \). Compute the net safe bearing capacity of the soil with a factor of safety of \( 3 \), when the water table is at a depth of \( 0.5 \)m & \( 1.5 \)m below the ground level. Given \( G = 2.65, \ e = 0.7, \ Degree \ of \ saturation \ above \ water \ table = 80\%, \ N_c=95, \ N_q=80.4, \ N_{\gamma}=100.2. \ (KTU \ Dec \ 2017) \ (10) \)
   (b) Explain the functions of vertical drains in reducing the settlement?\( (5) \)

3. (a) Briefly discuss soil stabilization through pre-loading. \( (KTU \ Dec \ 2018)(5) \)
   (b) What is equations and limitations of Terzaghi’s bearing capacity theory. \( (5) \)
   (c)What remedial measures can be taken to control the differential settlement of foundations \( (5) \)

4. Calculate the net safe bearing capacity of a rectangular footing \( 2 \times 4 \)m in plan, founded at a depth of \( 1.5 \)m below the ground surface. The load on the footing acts at an angle of \( 15^\circ \) to vertical. Saturated unit weight of soil = \( 18 \)kN/m\(^3\), cohesion = \( 15 \)kPa, angle of internal friction = \( 30^\circ \). Natural water table is at a depth of \( 2 \)m below ground surface. Use IS 6403- 1981 recommendations. Assume the soil to be fully saturated above water table and factor of safety against shear failure as \( 2.5 \) \( (KTU \ May \ 2018)(15) \)

5. (a) What are the harmful effects of differential settlement? \( (KTU \ Dec \ 2019)(5) \)
   (b) Differentiate between safe bearing capacity and safe bearing pressure? \( (5) \)
   (c) Differentiate between ultimate bearing capacity, safe bearing capacity and allowable bearing capacity? \( (5) \)

6. (a) Explain the term floating foundation? \( (KTU \ Dec \ 2019)(5) \)
   (b)Write a note on influence of water table on bearing capacity? \( (5) \)
   (d) Differentiate between total and differential settlement? \( (5) \)
1. (a) Under what situations raft foundation is preferred? (*KTU Dec 2017*) (5)
   
   (b) Explain with neat sketches, the various elements of a well foundation.*10*

2. Design the plan dimensions of a trapezoidal footing to support two adjacent columns at a centre to centre distance of 5m carrying loads of 1500kN and 3000kN. The smaller column is of size 400mmx400mm and is at a clear distance of 250mm from the property line. The bigger column is of size 750mmx750mm. The permissible soil pressure is 300kPa. (*KTU Dec 2017*) (15)

3. Determine the plan dimension of a combined footing to support two columns (Column A: Q = 1000 kN, size = 0.3 m x 0.3 m; Column B: Q= 800 kN, size = 0.2 m x 0.2 m). Centre to centre distance between columns is 3.6 m. Distance available beyond the outer face of the 1000 kN column is only 0.2 m. Assume safe bearing capacity of the column as 270 kPa. Also mention the situations wherein combined footings are needed. (*KTU Dec 2018*) (15)

4. Briefly explain all methods for rectification of tilts and shifts with neat sketches. (*KTU Dec 2019*) (15)

5. (a) What are the forces acting on well foundation? (*KTU Dec 2019*) (5)
   
   (b) In what situation raft foundation is preferred? (5)
   
   (c) What do you mean by a fully compensated raft? (5)

6. (a) Explain the design steps of trapezoidal and rectangular footing. What are the practical conditions under which both are used? (*KTU Dec 2019*) (10)
   
   (b) Explain the components of a well foundation with a neat sketch. (5)
1. (a) What is negative skin friction? What are the effects of negative skin friction in the load carrying capacity of pile? *(KU Dec 2013)(5)*
   (b) What is dynamic pile capacity? *(5)*
   (c) Write the dynamic formula for calculating load carrying capacity of pile? *(5)*

2. A group of 9 piles 12m long and 250mm in diameter is to be arranged in a square form in clay with an average unconfined compressive strength of 60kN/m2. Determine the center to center spacing of the pile for group efficiency of 1. Neglect bearing at the tip. α=0.9? *(KTU Dec 2017)(5)*

3. Using modified Hiley’s formula, determine the safe load that can be carried by a pile. The gross weight of the pile is 1400kg, weight of hammer 2000kg, height of fall 91cm, hammer efficiency 70%, and average penetration under the last 5 blows is 10mm, coefficient of restitution is 0.55 and the factor of safety is 2.5. Assume C=2.5 and e = 0.5? *(KTU Dec 2017)(15)*

4. A 2 x 3 pile group (diameter of pile = 400 mm; length = 10m) is installed in a layered cohesive soil with the following properties. Upper layer: cohesion = 70 kPa; adhesion factor = 0.5; unit weight of soil=16kN/m3; Thickness=6m. Lower layer; cohesion = 150 kPa; adhesion factor = 0.4; unit weight of soil = 20 kN/m3. Determine the safe load carrying capacity of the pile group? *(KTU Dec 2018) (15)*

5. How can the safe load on a pile be estimated from static pile load test results? Explain the procedure with graphs and IS methods *(KTU Dec 2019)(15)*

6. (a) How will you estimate the group capacity of pile in sand and clay? *(KTU Dec 2019)(5)*
   (b) Discuss any two dynamic formula? What are their limitations? *(10)*
1. (a) Explain with a neat sketch, the wash boring method. What are its advantages and disadvantages? *(KTU Dec 2017)*(5)

   (b) Explain mass spring model for undamped free vibration? (5)

   (c) What are the main objectives of the site investigation? (5)

2. (a) Explain in detail the procedure for standard penetration test. *(KTU Dec 2017)*(5)

   (b) Explain the corrections to be applied to Standard Penetration Test results. (5)

   (c) Write a note on uniform elastic compression? (5)

3. (a) What is meant by Coefficient of uniform elastic compression? Mention any two methods for vibration isolation *(KTU Dec 2018)* (5)

   (b) Explain wash boring with neat sketches? *(10)*

4. (a) Explain mass spring analogy with reference to machine foundation? *(KTU Dec 2018)*(5)

   (b) Explain with neat sketches the isolation methods adopted in vibrations? *(10)*

5. (a) A standard penetration test was conducted on saturated fine sand below the ground water table. The SPT value was found to be 32. Does the value represent the true SPT value? Explain? *(KTU Dec 2018)*(7)

   (b) How will you select the depth of boring in soil exploration programme? (8)

6. (a) The standard penetration obtained in a course sand deposited at a depth of 6m was 24. The ground water table is at a depth of 3m below the ground level. The dry density was 17.6Kn/m³ and saturation density 20.8kn/m³. What is the corrected N value after applying necessary corrections? *(10)*

   (b) What is the natural frequency of a machine foundation having a base area of 2mx2m and weight 150Kn including the weight of machine. Total coefficient of elastic compression 4x10^4Kn/m³. *(KTU Dec 2019)*(5)