



KERALA AGRICULTURAL UNIVERSITY
B. Tech. (Agrl. Engg.) 2024 Admission
IV Semester Final Examination – July 2026

IDE 2202

Theory of Structures (1+1)

Marks: 50
Time: 2 hours

(10x1=10)

I

State True or False

1. Two-way slabs bend in one direction only.

Match the following

Column A	Column B
A. One-way slab	1. Load carried in both directions
B. Two-way slab	2. Load carried mainly in one direction
C. One-way slab	3. Reinforcement provided in one main direction
D. Two-way slab	4. Reinforcement provided in both directions
E. One-way slab	5. Aspect ratio (L_y/L_x) ≥ 2
F. Two-way slab	6. Aspect ratio (L_y/L_x) < 2

Fill in the blanks

3. The slenderness ratio is defined as
4. In steel design, yielding occurs at..... stress.
5. Wind load is calculated as per.....code.
6. The material retained or supported by the retaining structure is called
7. The maximum compressive strain in concrete at the outermost fiber in bending (limit state of collapse) as per IS 456:2000 is
8. In the limit state method, the maximum strain in tension reinforcement (HYSD bars) at failure shall not be less than
9. The minimum grade of concrete as per IS 456 is

Answer the following

10. According to IS 800:2007, what is the partial safety factor for material resistance governed by yielding?

II

Write short notes on ANY FIVE of the following

(5x2=10)

1. one-way slab and two-way slab
2. Limit state method
3. Tension members in steel structures
4. The pitch and slope of roof truss.
5. Cantilever Retaining wall
6. Column and its types
7. Silos

III

Answer ANY FIVE of the following

(5x4=20)

1. Draw the stress block diagram for singly reinforced section.
2. Define development length & state factors affecting development length.
3. State the conditions of formation of flanged beams & state effective flange width for T & L beam.
4. In steel constructions bolts of grade 4.6 are generally used. What do you mean by grade 4.6?

5. What are the assumptions made in the design for the limit state of collapse in flexure of reinforced cement concrete (RCC) members?
6. Compute the tensile strength due to yielding of an angle section ISA 100x100x10mm (gross area = 1900 mm²) of grade Fe 410 grade steel connected with a gusset plate by welding.
7. A simply supported beam of span 5m carries a working udl of intensity 40 kN/m. Size of beam 350 x 500mm (effective). It is reinforced with 4 bars 20mm diameter. Design 8mm diameter 2 legged stirrups if one 20 mm diameter bar is bent up. Take $\tau_c = 0.5 \text{ N/mm}^2$ and $\tau_{cmax} = 2.8 \text{ N/mm}^2$. Use M20 grade & Fe415 steel.

IV

Write an essay on ANY ONE of the following

(1x10=10)

1. Design a one-way slab with following data span = 5.0 m, Live load = 4.5 kN/m², Floor finish = 1 kN/m². Concrete M 20 and steel Fe 415, M.F. = 1.4. Sketch c/s of slab showing reinforcement details.
2. (a) Calculate the areas of reinforcement required for simply supported RC beam to resist an ultimate moment of 50kN-m. The width of beam is 230 mm and overall depth is 350mm. Take 30mm effective cover, M20 and Fe415 grade of materials. Using Limit State Method (LSM).
(b) A short column 400mm x400 mm is reinforced with 4no. of 20mm diameter bars. Find the ultimate load carrying capacity of the column if the minimum eccentricity is less than 0.05 time the lateral dimensions. Use M20 and Fe415 grade of materials.
