**KERALA AGRICULTURAL UNIVERSITY**
**B.Tech. (Agrl. Engg.) 2021 Admission**
**II Semester Final Examination – September 2022**

**Iden.1203** **Strength of Materials (1+1)** **Marks: 50**
**Time: 2 hours**

**I** **Fill in the blanks** **(10x1=10)**

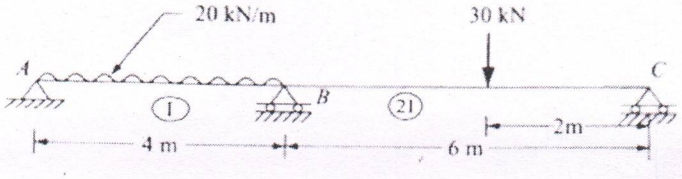
1. For maximum deflection, the slope will be .....
2. The load on conjugate beam at any point is equal to the ..... at that point divided by EI.
3. If the reservoir is empty, then the only force acting on the dam is .....
4. All short columns fail due to .....whereas long columns fail due to buckling and crushing.
5. The ratio of the effective length to the least radius of gyration is known as .....
6. The fixed end moments for a fixed beam of spam 'L' with uniformly distributed load of 'w' over the entire length is .....
7. A continuous beam is one which has more than ..... supports.
8. The number of degree of indeterminacy for a propped cantilever is .....
9. If the member of a structure is not vertical and one or both of its ends are hinged or pin joined, the bar is known as .....
10. The maximum deflection of a simply supported beam of span 'L' with a central concentrated load of 'W' is .....

**II** **Write short notes on ANY FIVE of the following** **(5x2=10)**

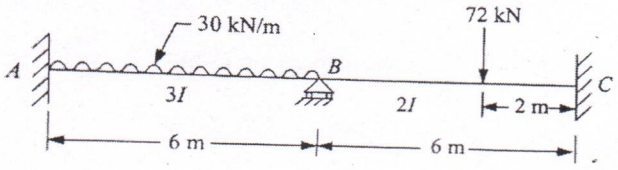
1. Crippling load
2. Macaulay's method
3. Carryover moment
4. Flexural rigidity
5. Conjugate beam
6. Short column & Long Column
7. Statically indeterminate structures

**III** **Answer ANY FIVE of the following** **(5x4=20)**

1. A beam 6 m long, simply supported at its ends, is carrying a point load of 50 kN at its centre. The moment of inertia of the beam is given as equal to 78 x $10^6$ $mm^4$. If E for the material of the beam = 2.1 x $10^5$ $N/mm^2$, calculate:
   (i) Deflection at the centre of the beam.
   (ii) slope at the supports.
2. Derive the equations for slope and deflections of a cantilever beam carrying a point load at the free end using moment area method.
3. What are the assumptions made in Euler's column theory?
4. Derive Rankine's equation.
5. Analyze the continuous beam using three moment equation and draw the bearing moment diagram.



6. Analyze the continuous beam using moment distribution method and draw the bending moment diagram.




7. A trapezoidal masonry dam having 4 m top width, 8 m bottom width and 12 m high, is retaining water up to a height of 10 m. The density of masonry is 2000 kg/m$^3$ and coefficient of friction between the dam and soil is 0.55. The allowable compressive stress is 343350 N/m$^2$. Check the stability of the dam.

**IV** **Write an essay on ANY ONE of the following** **(1x10=10)**

1. A beam of length 6 m is simply supported at its ends and carries two point loads of 48 kN and 40 kN at a distance of 1 m and 3 m respectively from the left support. Find
   (i) Deflection under each load
   (ii) Maximum deflection
   (iii) The point at which maximum deflection occurs
   Take E = 2 x $10^5$ N/mm$^2$ and I = 85 x $10^6$ mm$^4$
2. A 1.5 m long column has a circular cross-section of 5 cm diameter. One of the ends of the column is fixed in direction and position and other end is free. Taking factor of safety as 3, calculate the safe load using:
   (a) Rankine's formula, taking yield stress, $\sigma_c$ = 560 N/mm$^2$ and Rankine's constant $a$ = 1/1600 for pinned ends.
   (b) Euler's formula, Young's modulus = 1.2 x $10^5$ N/mm$^2$.

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