KERALA AGRICULTURAL UNIVERSITY
B. Tech. (Agrl. Engg.) 2023 Admission
II Semester Final Examination – July 2024

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

I **State True or false** **(10x1=10)**

1. Piston rod is an example of strut.
2. If y indicates the deflection, then slope is represented as $\frac{dy}{dx}$
3. If y indicates the deflection, then shear force is $EI\frac{d^2y}{dx^2}$

Fill in the blanks

4. The ratio of equivalent length of column to the minimum radius of gyration is called.....
5. The buckling, in case of a column, takes place about the axis having ..... radius of gyration.
6. In a Cantilever beam, the slope and deflection is maximum at ..... end.
7. .....method is used for finding out slope and deflection at a section in a loaded beam subjected to several loads.
8. A beam of length l, fixed at both ends, carries a uniformly distributed load of w per unit length. If EI is the flexural rigidity of the beam, the maximum deflection in the beam is .....
9. The slope and deflection at the center of a simply supported beam carrying a central load are.....
10. In the case of a beam simply supported at both ends, if the same load instead of being concentrated at center is distributed uniformly throughout the length, then deflection at the center will get reduced by ..... times

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

1. Define strut by giving at least three examples.
2. Define statically indeterminate beams with suitable examples.
3. Compare merits and demerits of fixed beams as compared to the simply supported beam.
4. Define strength of the columns.
5. What are the methods used for determining slope and deflection?
6. Which is the masonry dam in India?
7. What is the middle third rule of rectangular column section? Define limits of eccentricity of the rectangular section.

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

1. Define equivalent length of the column and its value for all conditions under which a column is subjected to buckling load. Write the condition under which it can take maximum load without buckling.
2. A beam of uniform rectangular section 200 mm wide and 300 mm deep is simply supported at its ends. It carries a uniformly distributed load of 9 KN/m run over the entire span of 5 m. if the value of E for the beam material is 1×10^4 N/mm^2, find the slope at the supports and maximum deflection.
3. In a tension specimen 13 mm in diameter, the line of pull is parallel to the specimen but is displaced from it. Determine the distance of the line of pull from the axis, when the maximum stress is 15 percent greater than the mean stress on a section normal to the axis.
4. The external and internal diameters of the hollow cast iron column are 5 cm and 4 cm respectively. If the length of this column is 3m and both of its ends are fixed, determine the crippling load using Rankine's formula. Take σ_c= 550N/mm^2 and a=1/1600.

5. A fixed beam AB of length 3 m carries a point load of 45kN at a distance of 2 m from A. If the flexural rigidity (i.e. KI) of the beam is 1×10^4 kNm^2, determine:
   (i) fixed end moment at A and B
   (ii) Deflection under the load
   (iii) maximum deflection and
   (iv) position of maximum deflection.
6. A cantilever of length 3 m carries a uniformly distributed load of 80kN/m over the entire length. If $E = 2 \times 10^8$ kN/m^2 and $I = 10^8$ mm^4, find the slope and deflection at the free end using conjugate beam method.
7. A continuous beam ABC covers two consecutive span AB and BC of lengths 4 m and 6 m, carrying uniformly distributed loads of 6 kN/m and 10 kN/m respectively. If the ends A and C are simply supported, find the support moments at A, B and C. Draw also Bending moment and shear force diagram.

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

1. List the limitations of Euler's theory. Derive the expression for columns with one end fixed and other end free with Euler's theory.
2. Define continuous beam and drive the relation for analysis of continuous beam by using Clapeyron's Theorem of Three Moments.

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