



KERALA AGRICULTURAL UNIVERSITY
B.Tech.(Agri. Engg) 2018 Admission
II Semester Final Examination- June 2019

I den.1203

Strength of Materials (1+1)

Marks: 50

Time: 2 hours

(10x1=10)

I A Fill in the blanks

- 1 The ratio of the effective length to the least radius of gyration is known as
- 2 A is a compression member of a truss, a is a principal compression member in crane.
- 3 If the flexural rigidity is not uniform throughout the length of the beam, then method is used for finding the slope and deflection
- 4 For a Hinge support in a given beam slope exists and deflection is, while in conjugate beam Shear force exists and bending moment is
- 5 A moment which is applied to a structural joint to produce without translation gets distributed among the connecting members at the joint in the same proportion as their

B Match the following

- | | |
|----------------------|------------------------------|
| 6 Hinge support | a. Slenderness ratio < 50 |
| 7 Fixed end | b. S.F exists and BM is zero |
| 8 Short steel column | c. S.F and BM are zero |
| 9 Free end | d. Slenderness ratio >200 |
| 10 Long steel column | e. S.F and B.M exists |

II Write Short notes on any FIVE of the following (5x2=10)

- 1 Enumerate the methods for finding out the slope and deflection of a beam. Explain any one.
- 2 Enumerate the assumptions made in Euler's theory of long columns.
- 3 State the assumptions made in Euler's theory of long columns.
- 4 What is conjugate beam? State its applications.
- 5 Enumerate the various causes of failure of dams.
- 6 State Clapeyron's theorem of three moments.
- 7 How do you classify statically indeterminate beams?

III Answer any FIVE of the following. (5x4=20)

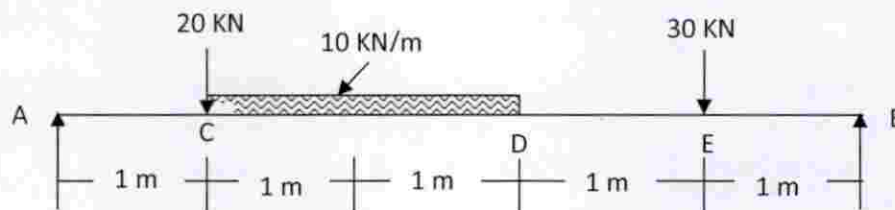
- 1 A cantilever of length l carries a point load at a distance l_1 from the fixed end. Calculate the slope and deflection at the free end for the conjugate beam.
- 2 A 4 m simply supported beam carries a concentrated load of 20 kN in the middle of the beam. If $E = 200$ GPa and $I = 50 \times 10^6$ mm⁴, calculate the deflection under the load using conjugate beam method.
- 3 Derive the relation for the Euler's Crippling load for a column when one end is fixed and the other end is hinged
- 4 A cast iron circular column of 20 cm external diameter, 2 cm thickness and 4 m long carries a load of 15 at an eccentricity of 2.5 cm. Find the extreme stresses on the column section.

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- 5 A dam section of 8 m high with 7.5 m of water impounded has a base width of the dam of 5m. The weight of masonry structure is 2240 kg/Cu.m. The water face of the dam is vertical. Find the minimum and maximum stress intensities at the base.
- 6 A hollow iron cast of 4.5 m long, with internal diameter of 200 mm and 20 mm thick is fixed at both ends. Calculate the safe load by Rankine's formula using a factor of safety of 2.5. Find the ratio of Euler's to Rankine's loads. Take $E = 1 \times 10^5 \text{ N/mm}^2$ and Rankine's constant as $1/1600$ for both ends pinned case and $f_c = 550 \text{ N/mm}^2$.
- 7 A 2.5 m long Strut of 6 cm diameter is fixed at one end while its other end is hinged. Find the safe load for the member using Euler's formula allowing a factor safety of 3.5. Take $E = 2.1 \times 10^6 \text{ kg/cm}^2$.

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

- 1 Determine the deflections at point C, D and E in a simply supported beam as shown below. Plot the elastic curve. Take $E = 200 \text{ KN/mm}^2$ and $I = 60 \times 10^6 \text{ mm}^4$.



- 2 A simply supported horizontal girder of 14 m is loaded by two concentrated loads of 12 t and 8 t at a distance of 3m and 4.5 m respectively from the two ends respectively. Calculate the deflection of the girder under each loads. Take $I = 16 \times 10^4 \text{ cm}^4$ and $E = 2.1 \times 10^6 \text{ kg/cm}^2$.
