



KERALA AGRICULTURAL UNIVERSITY

B.Tech.(Agri. Engg) 2017 Admission

II Semester Final Examination- July 2018

Iden.1203

Strength of Materials (1+1)

Marks: 50  
Time:2hours

I A Choose the appropriate answer

(10x1=10)

- 1 For a simply supported beam of span 4m carrying point load at mid span, the slope at the mid span is  
a. 4                      b. 8                      c. 2                      d. Zero
- 2 When a structural member of uniform section is subjected to a moment at one end only, then the moment required so as to rotate that end to produce unit slope, is called as  
a. Strength              b. Eccentricity              c. Stiffness              d. Rigidity
- 3 At the point of contra flexure, shear force is ..... and bending moment is  
a. both zero              b. max, min              c. min, max              d. both are increasing
- 4 In order tension may not be produced at the section of a dam, the eccentricity e  
a.  $e = \left(\frac{b}{3}\right)$               b.  $e < \left(\frac{b}{6}\right)$               c.  $e > \left(\frac{b}{6}\right)$               d.  $e = b$
- 5 The relative stiffness of a member at a joint, whose far end is fixed is  
a.  $\frac{1}{2} \left(\frac{I}{l}\right)$               b.  $\frac{3}{4} \left(\frac{I}{l}\right)$               c.  $\left(\frac{I}{l}\right)$               d.  $\left(\frac{l}{I}\right)$

B Match the following

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

I Write Short notes on any FIVE of the following

(5x2=10)

- 1 Macaulay's method for finding out the slope and deflection of a beam.
- 2 Limitations of Euler's theory of long columns.
- 3 Flexural rigidity
- 4 Moment-area method. Illustrate Mohr's theorems.
- 5 Enumerate the scheme of classification of columns and struts.
- 6 Clapeyron's theorem of three moments.
- 7 Statically indeterminate beams.

P.T.O

**III Answer any FIVE of the following.**

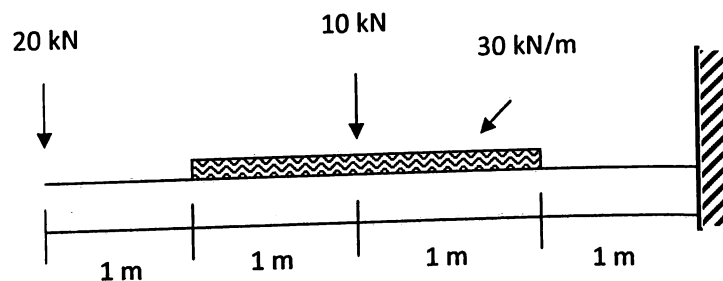
**(5x4=20)**

- 1 A cantilever of length  $l$  carries a uniformly distributed load of  $w$  per unit run over the whole length. Calculate the slope and deflection at the free end for the conjugate beam.
- 2 A cantilever of  $2\text{ m}$  length carries a uniformly distributed load of  $150\text{ kg/m}$  for a length of  $1.25\text{ m}$  from the fixed end and a point load of  $100\text{ kg}$  at the free end. If the section B is rectangular  $12\text{ cm}$  wide and  $24\text{ cm}$  depth, find the deflection at the free end.
- 3 Derive the relation for the Euler's Crippling load for a column when both the ends are fixed.
- 4 A continuous beam ABC consists of two span AB and BC of lengths  $6\text{ m}$  and  $8\text{ m}$ . The AB span carries a point load of  $12\text{ t}$  at  $4\text{ m}$  from A, while the span BC carries a point load of  $16\text{ t}$  at  $5\text{ m}$  from C. Find the moments and reactions at the supports.
- 5 A dam section  $8\text{ m}$  high with  $7.5\text{ m}$  of water impounded have a top width of  $1\text{ m}$ . The weight of masonry structure is  $2240\text{ kg/m}^3$ . Find the minimum bottom width required. Consider that the coefficient of friction =  $0.6$  and the water face of the dam is vertical.
- 6 A  $2\text{ m}$  long pin ended column of square cross section is to be made of wood. Determine the size of the column to support the following loads safely. a)  $95\text{ kN}$ , b)  $200\text{ kN}$ , use factor of safety of  $0.3$  and Euler's crippling load for buckling. Assume  $E=12\text{ GPa}$  and allowable stress being limited to  $12\text{ MPa}$ .
- 7 A short column of external diameter  $D$  and internal diameter  $d$  carries an eccentric load  $W$ . Find the greatest eccentricity which the load can have without producing tension on the cross section of the column.

**IV Answer any ONE of the following**

**(1x10=10)**

- 1 Plot the elastic curve and find the maximum deflection and slope for the cantilever beam loaded as shown in figure. Take  $E = 200\text{ kN/mm}^2$  and  $I = 300 \times 10^6\text{ mm}^4$ .



- 2 A simply supported beam of  $10\text{ m}$  is loaded by two concentrated loads of  $10\text{ t}$  and  $6\text{ t}$  at a distance of  $2\text{ m}$  and  $5\text{ m}$  respectively from the left end. Calculate the deflection under each load. Find also the maximum deflection. Take  $I = 18 \times 10^4\text{ cm}^4$  and  $E = 2 \times 10^4\text{ kg/cm}^2$ .

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