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09ENG 3.5

# Third Semester B. Arch Degree Examination, June/July 2015

## Structures - III

Time: 3 hrs. Max. Marks:100

**Note:** ***Answer any FIVE full questions,***





1 a. Derive Torsional Equation with usual notations. **(12 Marks)**

b. A solid shaft is subjected to a maximum torque of 25 kN-m. Find a suitable diameter of a shaft if the allowable shear stress is $80 N/mm^2$. **(08 Marks)**

2 a. List the assumptions made in Torsion of shaft. **(05 Marks)**

b. A hollow shaft of diameter ratio $\frac{3}{5}$ is required to transmit 700kW at 110 rpm. The maximum torque being 12% greater than the mean. The shear stress is not to exceed 60 Mpa and twist in a length of 3m is not to exceed one degree. Calculate diameter of the shaft. Take $C = G = 0.8 \times 10^5$ Mpa. **(15 Marks)**

3 a. Prove that a hollow shaft is stronger and stiffer than the solid shaft of the same material, length and weight. **(10 Marks)**

b. Derive the expression for Euler's critical load for a long column with both ends hinged. **(10 Marks)**

4 a. Distinguish between long column and short column. **(05 Marks)**

b. List the assumptions made in Euler's theory of column. **(05 Marks)**

c. A column 6m long has both of its ends fixed and has a timber section of $150mm \times 200mm$. If young's modulus of timber is $17.5 \times 10^3 N/mm^2$, determine the crippling load on the column. **(10 Marks)**

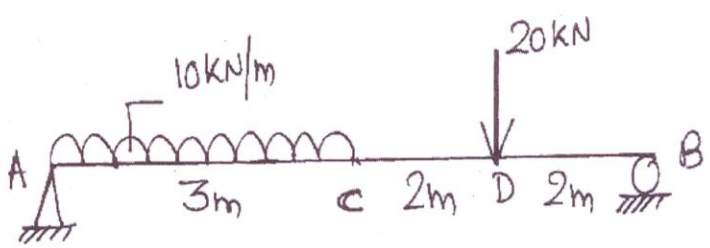
5 a. Derive Rankine's formula for column with usual notations. **(08 Marks)**

b. A hollow cast iron column fixed at both ends is 6m long. Its external diameter is 200mm and thickness of metal is 25mm. find the maximum safe load on it. Use Rankine's formula.

$FOS = 5$, $\sigma_c = 560 N/mm^2$ $a = \frac{1}{1600}$. **(12 Marks)**

6 a. Using moment –Area method determine maximum deflection in simply supported beam of span '$\ell$' and subjected to UDL "w". **(05 Marks)**

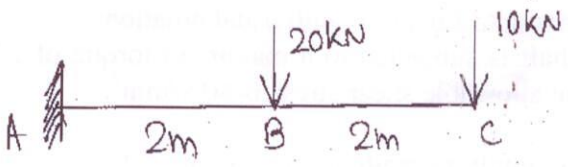
b. Using Macaulay's method, determine slope and deflection at point 'C' for the beam shown in Fig. Q No.6 (b) Take $EI = 8000 kN - m^2$




**(15 Marks)**

Fig. Q No.6 (b)

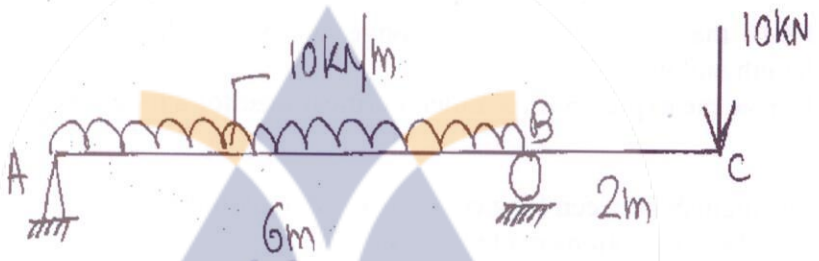
7 a. Using moment Area method, determine slope and deflection at free end for the beam shown in Fig. Q No.7 (a) Take $EI = 8000kN - m^2$




**(08 Marks)**

Fig. Q No.7 (a)

b. Using macaulay's method. Determine slope and deflection at 'C' Take $EI = 8000kN - m^2$ Ref Fig. Q No.7. (b)




Q No.7. (b)

**(12 Marks)**

8 Short Notes :

a) Define the polar Modulus, find the expression for sold shaft.
b) Define slenderness Ratio and its importance
c) Define moment Area I and II theorems.
d) Determine slope and deflection for cantilever beam with UDL throughout. **(20 Marks)**

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