

(3 Hours)

[Total Marks : 80

- N.B. :** (1) Question No. 1 is Compulsory.
 (2) Answer **any three** questions out of remaining **five** questions.
 (3) Assumption suitable data if necessary.

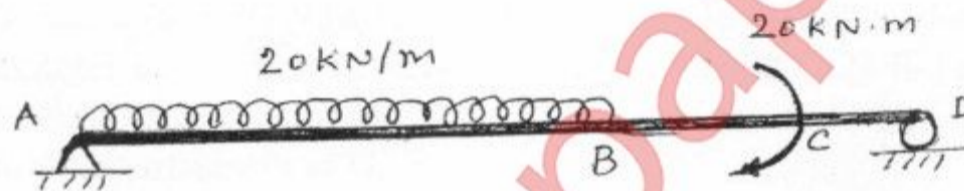
1. Briefly explain the following :-

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- Expression for strain energy due to suddenly applied with impact.
- Limit of eccentricity and its value for hollow circular section.
- Temperature stresses in composite bars.
- Bulk modulus and relationship between E, G and K.

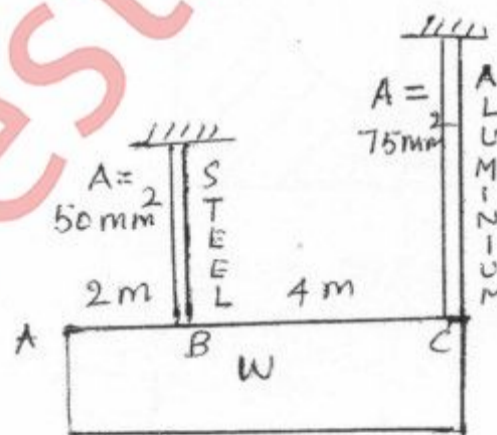
2 (a) Draw SF and BM diagram. Take AB=4m BC=CD=1m.

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- (b) A rigid plate ABC of weight w is supported by two rods of different materials. Determine the ratio of the steel rod to Aluminium rod which should be provided such that the Plate remains level. Take $E_s = 2 \times 10^5$ MPa and $E_{AL} = 8 \times 10^4$ MPa.

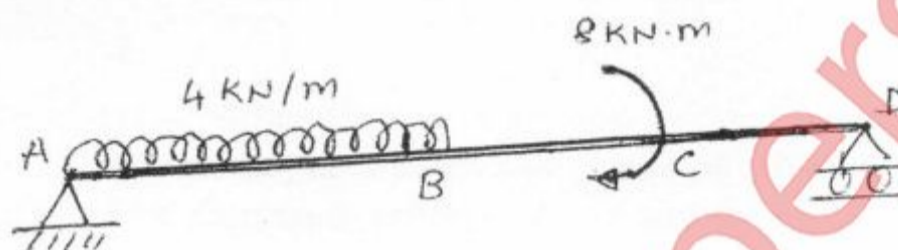
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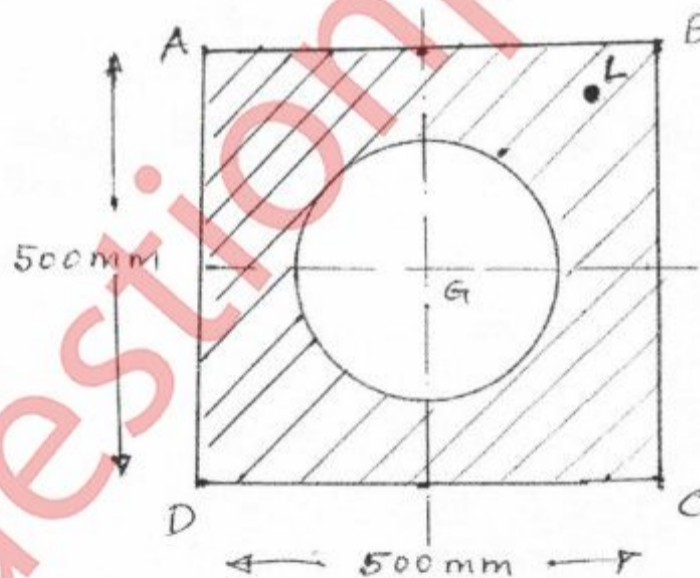
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3. A C I beam of span I-section with upper flange (80mmx20mm), bottom flange (160mmx40mm) thick and web 200 mm(deep) and 20mm thick. The beam is simply supported on a span of 5m. If the tensile stress in the beam is not to exceed 20N/mm^2 , find the UDL which the beam carry. Also find the maximum compressive stress. Also draw the variation of shear stress diagram considering maximum shear force. 20

4. (a) Find the slope and deflection at point C for the beam loaded as shown in fig. Express your answer interms of EI. Take $AB=4\text{m}$ $BC=CD=2\text{m}$. 10



- (b) 500mm x 500mm Square section has a hole drilled at the centre. The diameter of the hole is 300mm. If a load of 500 KN (C) acts at L whose coordinates are 200mm, 200mm find stresses at A, B, C and D. What is the value of stress at G. 10



5. (a) A shaft of 100mm diameter, 2m long is subjected to a torque of 8 KN.m 10
Calculate the maximum Shear stress and angle of twist.
If the central 1m length of shaft was reduced to 75mm diameter and same torque is applied, what would be the change in Shear Stress and angle of twist? Take $G = 80\text{ GPa}$.

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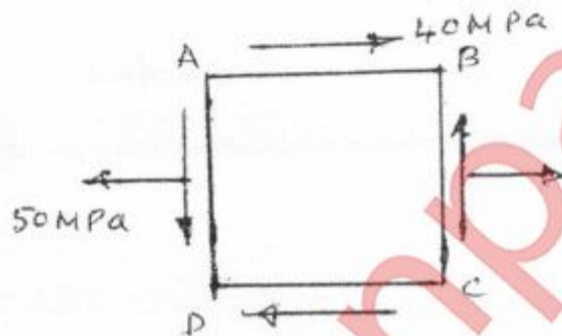
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- (b) Find the Euler's crushing load for a hollow cylindrical CI. column 200 mm external diameter and 25 mm thick, if it is 6m long and hinged at both ends. Take $E=1.2 \times 10^6 \text{ N/mm}^2$. Compare this load with crushing load given by Rankine's formula. Take $\sigma_c = 550 \text{ N/mm}^2$ and $\alpha = 1/1600$. 10

6. (a) With usual notation, derive any one of the following expression state the assumption made. 8

$$\frac{T}{J} = \frac{\tau}{r} = \frac{G\theta}{l} \quad \text{OR} \quad \frac{M}{I} = \frac{\sigma}{y} = \frac{E}{R}$$

- (b) For the states of stress shown, determine 8
- The principal stresses and planes on which it acts.
 - The maximum shearing stress and the planes on which it acts.



- (c) Find $I_{(xx)G}$ and $I_{(yy)G}$ for T section with flange 200 mm x 20mm and web 160mm deep and 20mm thick. 4