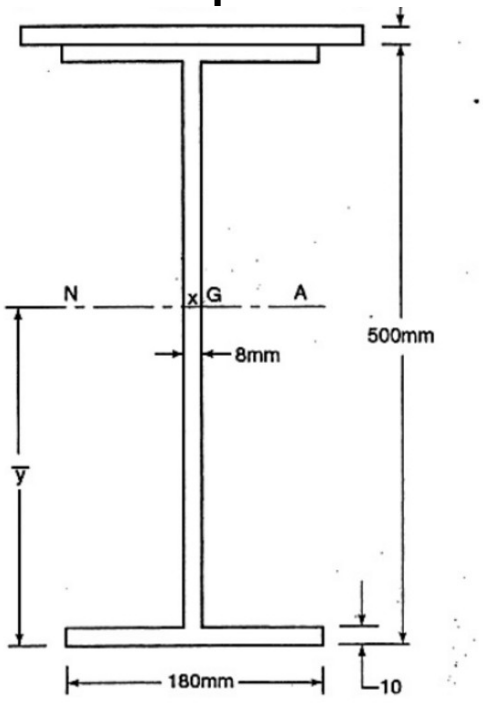
FAQ's

1. What is a composite beam and list its merits?

A structural member composed of two or more dissimilar materials joine d together to act as a unit. An example in civil structures is the steel-concretecomposite beam in which a steel wide-flange shape (I or W shape) is attached to a concretefloor slab. The ma ny other kinds of composite beam include steel-wood, wood-concrete, and plastic-concrete or advanced composite materials–concrete.There are two main benefits of composite action in structural members. First, by rigidly joining the two parts together, the resulting system is stronger than the sum of its parts. Second, composit e action can better utilize the propertiesof each constituent material. In case of composite beam, the concrete takes care of the compressive loading and steel sustains the tensile stress.

2. A symmetrical I section has flanges of size 180mm x 10mmand overall depth of 500mm.thickness of web is 8mm. it is strengthened with a plate of size 240mm x 12mm on compression side. Find the moment of resistance of the section if the permissible stress is 150Mpa. How much udl it can carry if it is used as cantilever of span 3m?

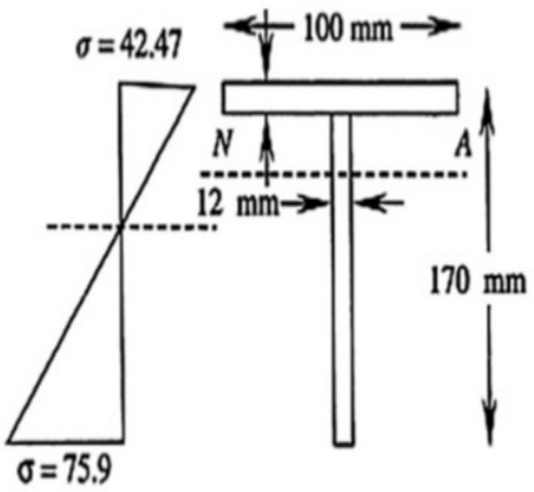


$\bar{y}$= Moment of area about bottom fibre/total area of compound section
=(240x12x506+180x10x495+180x10x5+480x8x250)/

(240x12+180x10+180x10+480x8)
=3317280/10320 = 321.442mm
$I = ((240x12^3/12) + (240x12(506-321.442)^2$
$+(180x10^3/12) + (180x10(495-321.442)^2 + (180x10^3/12)$
$+ (180x10(5-321.442)^2 + (8x480^3/12)+(8x480(250-321.442)^2)$
$I= 4.25952x10^8 mm^4$
$y_{top}=512-321.442=190.558mm$
$y_{max}=\bar{y}=321.442mm$

Moment of resistance = f_{per}x Z
$=150 \times (4.25952x10^8/321.442)$
$= 198.769$ KNmm
Maximum moment in cantilever span subjected to udl (w)=$wl^2/2$
$= 4.5w$
Equating max. moment and moment of resistance
$4.5w=198.769$
$w=44.171$KN/m

3. A T-section is formed by cutting the bottom flange of an I-section. The flange is 100mmx20mm and the web is 20mm x150mm. Draw the bending stress distribution diagrams if bending moment at a section of beam is 10kN-m (hogging).
$M=10kNm=10x10^6Nmm$
Maximum bending stress occur at extreme fibres i.e at the top and bottom fibres which can be computed as
$\sigma=My/I$
$\bar{y}= ((100x20(150+10))+((20x150)(150/2)))/(100x20+20x150)$
$= 109mm$
Moment of inertia is given by
$I= ((100x20^3/12 + (100x20)\ (109-(150+10))^2)$
$+ ((20x150^3/12) + ((20x150)(109-75)^2)$
$= 14.36167x10^6 mm^4$
Substitute in stress equation,
$\sigma_{top}=My_t/I = (10x10^6x61)/14.36167x10^6$
$=42.4742\ N/mm^2$
$\sigma_{bottom}=My_b/I=(10x10^6x109)/14.36167x10^6$
$= 75.8965\ N/mm^2$
Bending stress diagram is given below


σ = 42.47
100 mm
N
A
12 mm
170 mm
σ = 75.9