DFCCIL 2023

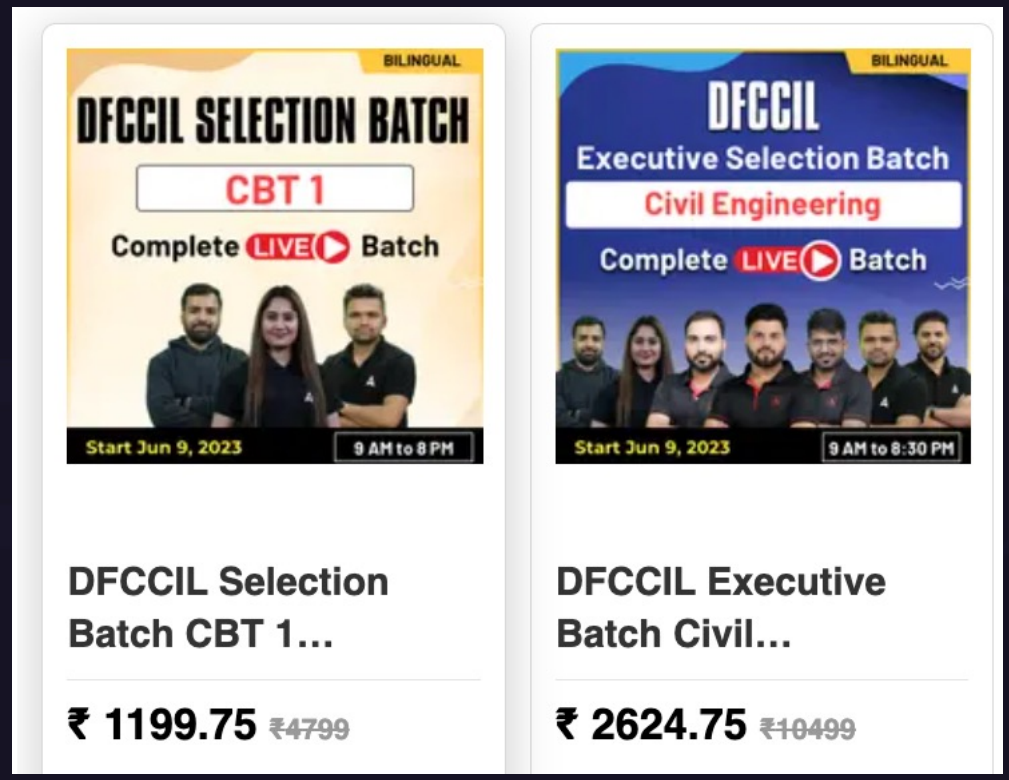
ENGINEERS

PREVIOUS YEAR PAPER SOLUTION

Civil Engineering

SET-1 BY RK SIR

Mechanical by Rk sir | Use Y201 Code for max disc.



About Rk Sir

1. 10 Year Teaching Experience
2. GATE Ranker
3. B.tech & MTech
4. More 1 Lakh student Taught
5. Highest selection ratio
6. Known for concepts

Q.

When the frequency of the exciting force is equal to one of the natural frequencies of the system, the amplitudes of motion become excessively large. The condition is known as:

- **resonance**
- **forced vibration**
- **damping**
- **free vibration**

Q. The flow in a pipe is termed as laminar if the Reynolds number is:

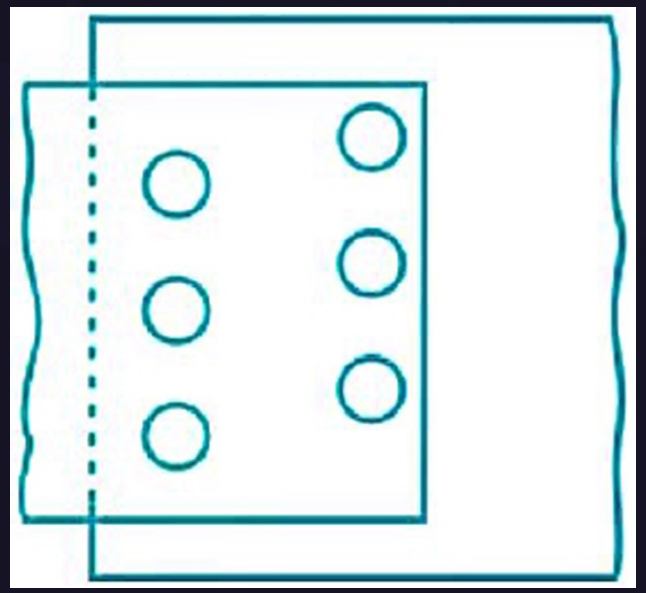
(a) between 2000 and 2800
(b) less than 2000
(c) more than 5000
(d) more than 2800

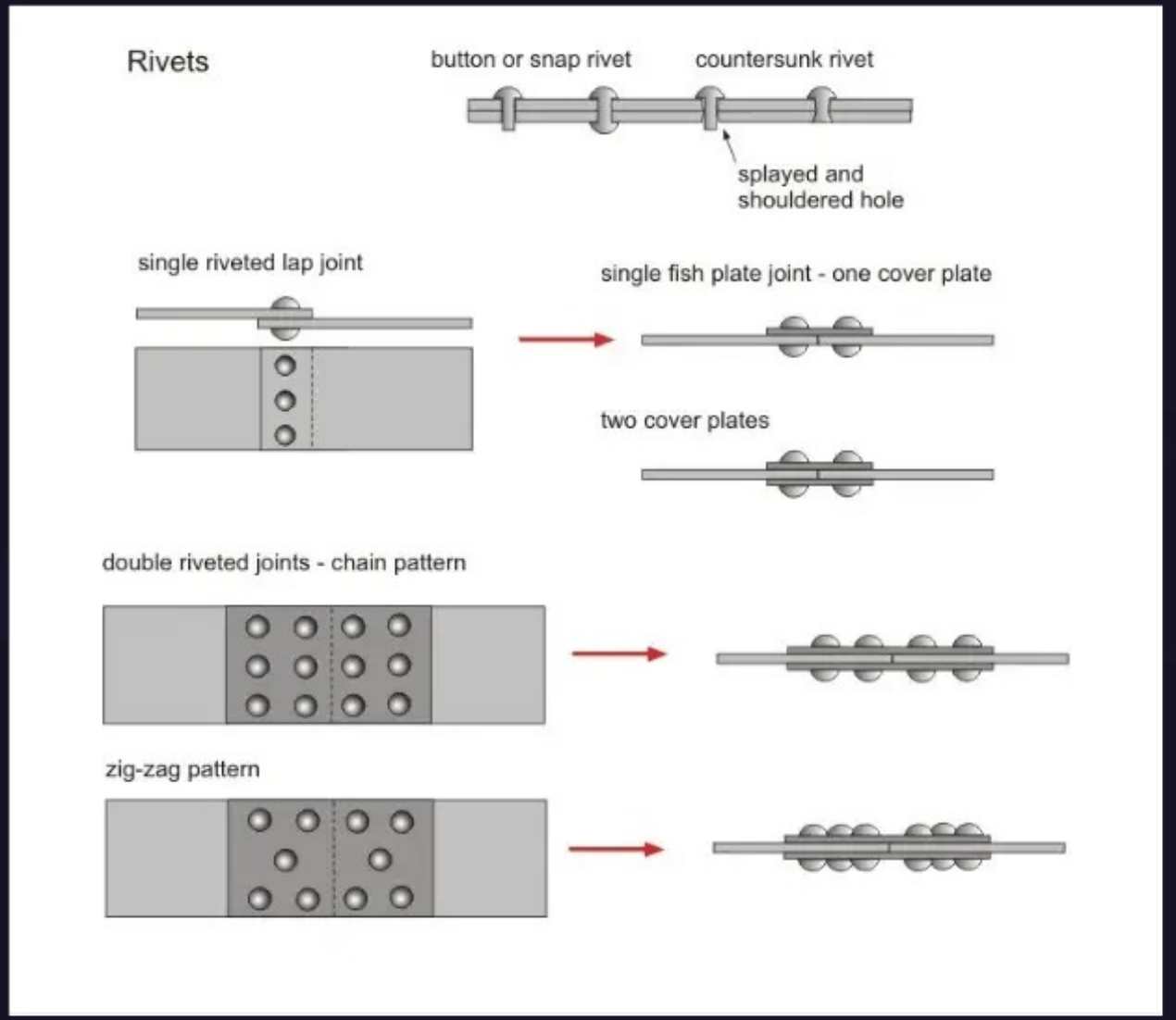
Value of Reynold's number on Flow Conditions

Flow Condition	Pipe Flow	Open Channel Flow
Laminar Flow	$Re \leq 2000$	$Re \leq 500$
Transitional Flow	$2000 < Re < 4000$	$500 < Re < 1000$
Turbulent Flow	$Re > 4000$	$Re > 1000$

Q. The given figure shows:

(a) a diamond riveted joint
(b) a links riveted joint
(c) Zig-zag riveted joint
(d) A criss-cross riveted joint





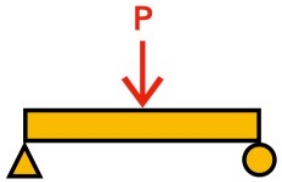
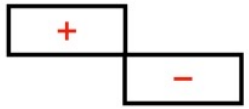
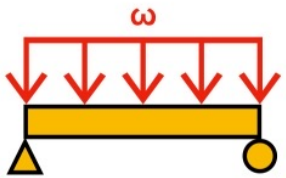
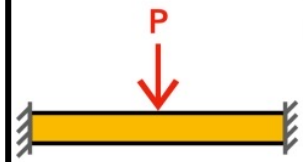
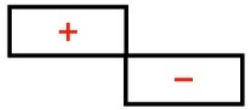
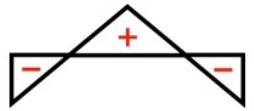
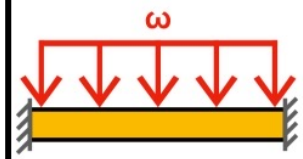
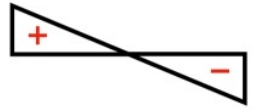
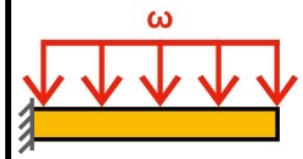
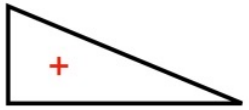
Q. The maximum bending moment for a simply supported beam with a uniformly distributed load w per unit length, is

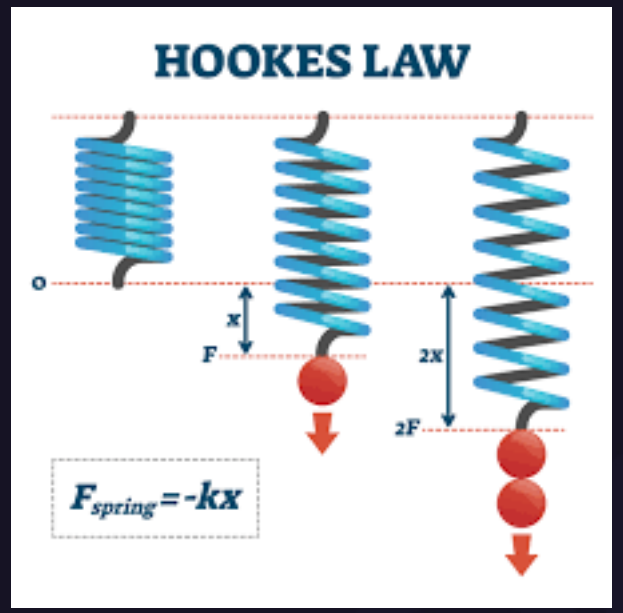
(a) wl /2

(b) $WL^2/4$

(c) $WL^2/8$

(d) $WL^2/12$

Loading	SFD	BMD
		
		
		
		
		
		

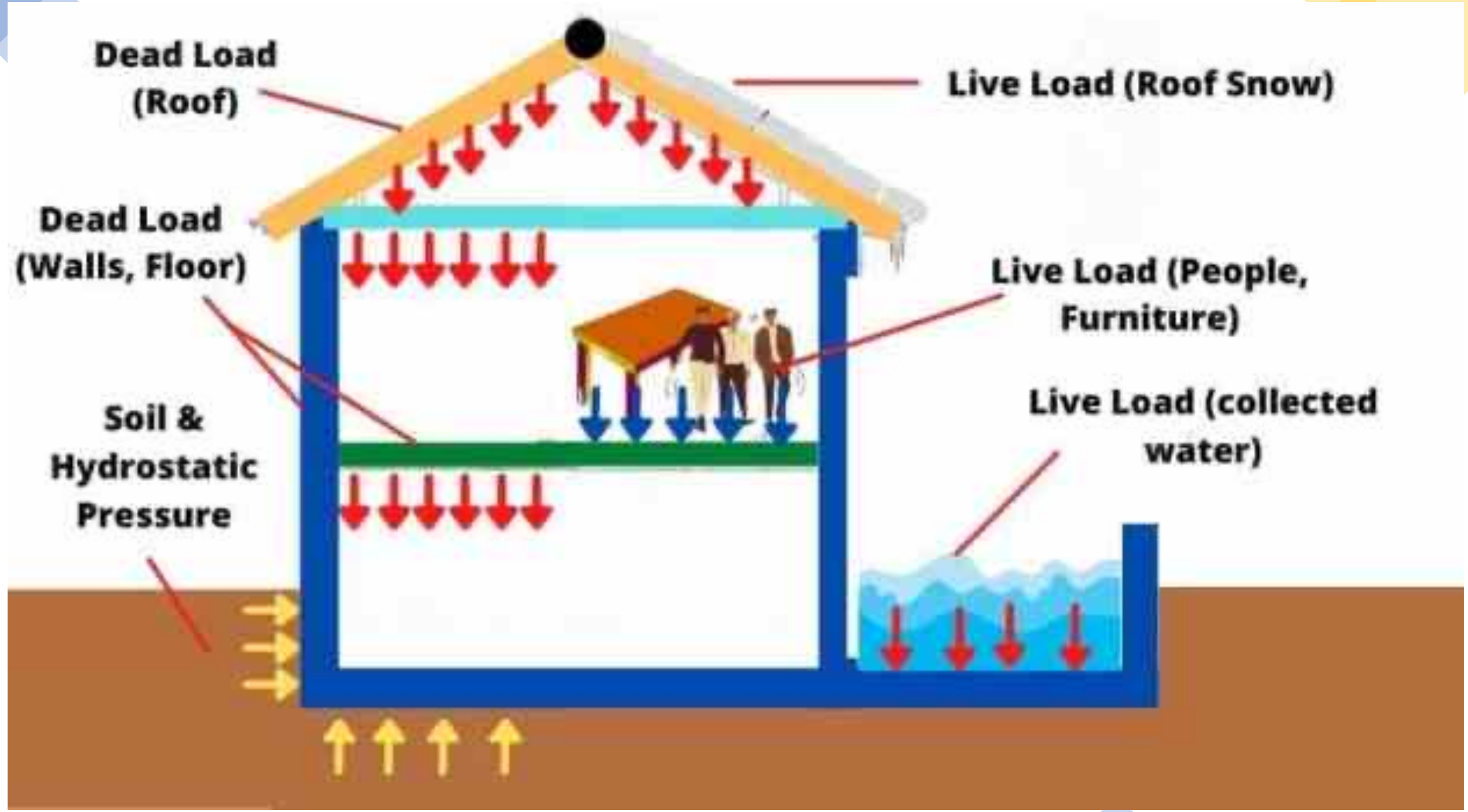


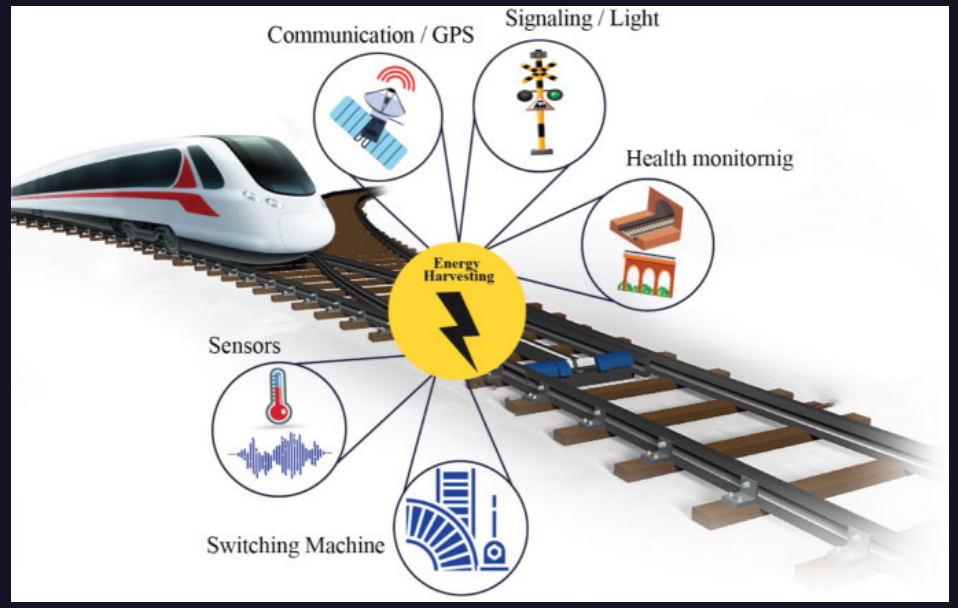
Q. According to Hooke's law, the extension of a spring or wire is directly proportional to the force applied, provided the _____ is NOT exceeded.

(a) limit of proportionality
(b) yield point
(c) breaking point
(d) elastic limit

Q. _____ include the weight of materials permanently fixed to a structure such as beams, floors, walls, columns and fixed service equipment.

(a) Computation loads
(b) Dead loads
(c) Live loads
(d) Structure loads


Dead Load
(Roof)
Live Load (Roof Snow)
Dead Load
(Walls, Floor)
Live Load (People,
Furniture)
Soil &
Hydrostatic
Pressure
Live Load (collected
water)

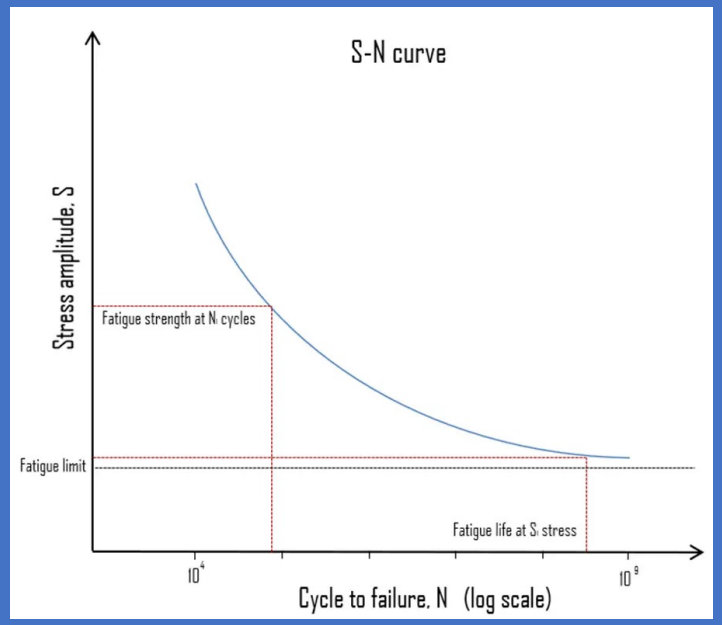


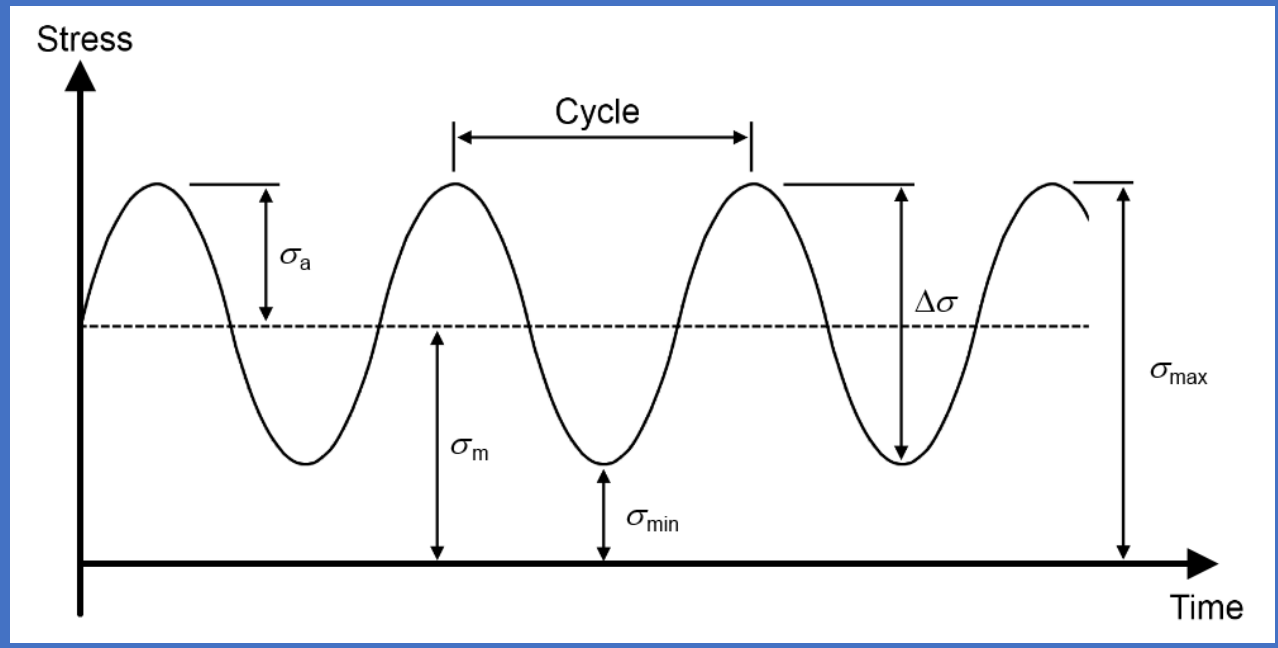
Q. Which of the following methods for measuring rail stresses is mostly used by Indian railways at present?

(a) Method employed using special test frame
(b) Photo-elastic method
(c) Electro-static method
(d) Electric resistance strain gauge

Q. _____is the phenomenon of a material failing under very little stress due to repeated cycles of loading.

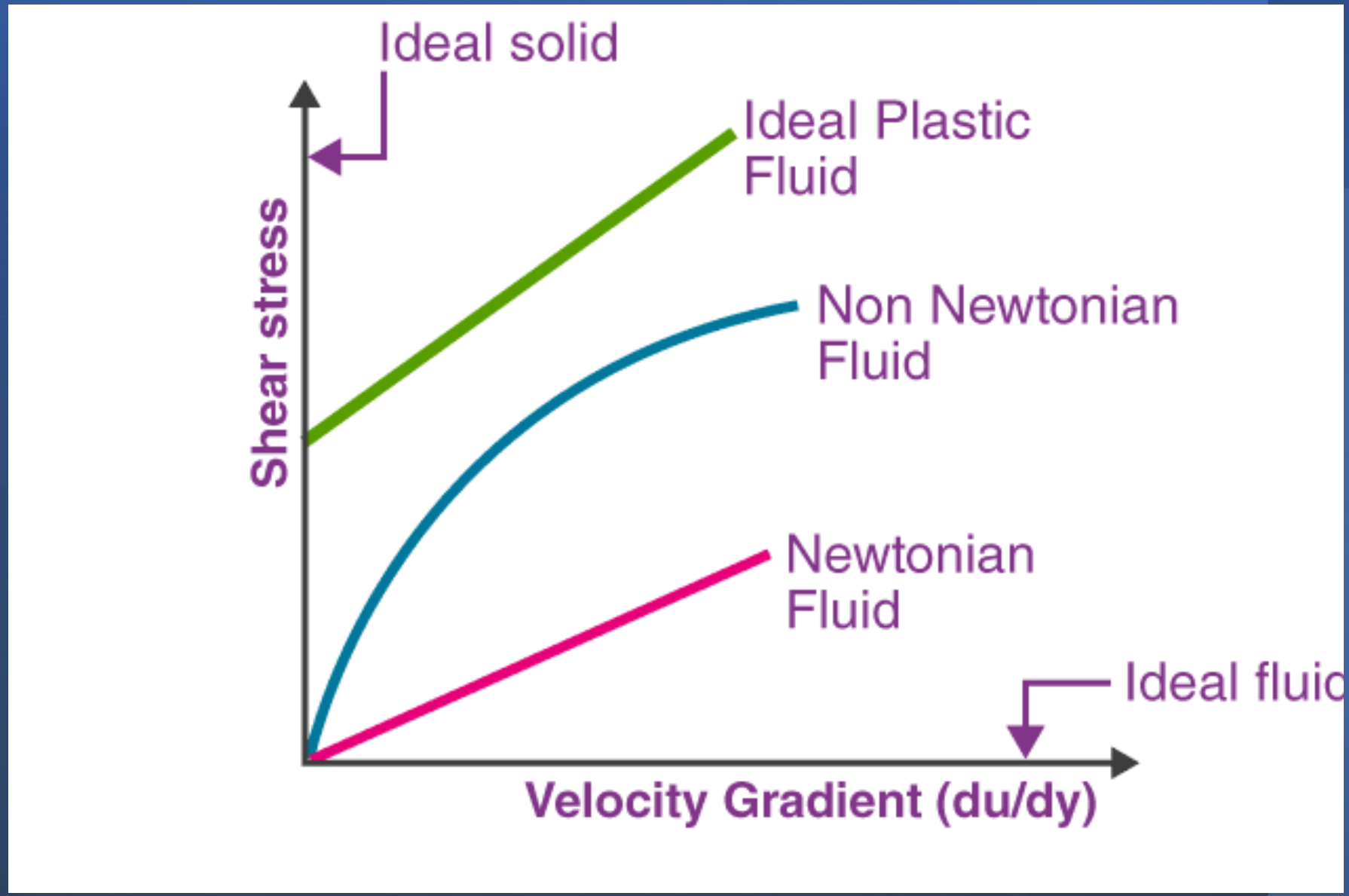
(a) Resilience
(b) Creep
(c) Brittleness
(d) Fatigue


S-N curve
Stress amplitude, S
Fatigue strength at N cycles
Fatigue limit
Fatigue life at S stress
10^4
10^9
Cycle to failure, N (log scale)


Stress
Cycle
σ_a
$\Delta\sigma$
σ_{max}
σ_m
σ_{min}
Time

Q. A fluid in which shear stress is more than yield and shear stress is proportional to shear strain is known as _____ .

(a) Ideal fluid
(b) Newtonian
(c) Non-Newtonian
(d) Ideal plastic

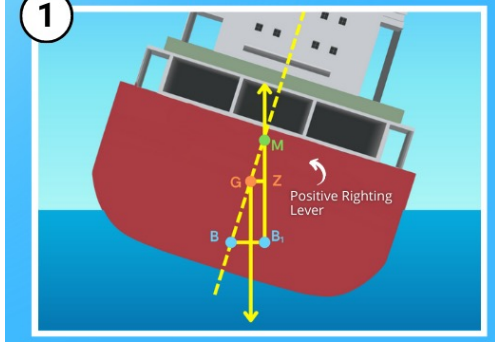

Ideal solid
Ideal Plastic Fluid
Non Newtonian Fluid
Newtonian Fluid
Ideal fluid
Shear stress
Velocity Gradient (du/dy)

Q. In the stability of floating bodies, the stable equilibrium is attained if the meta centre (M) point ____ the centre of gravity (G).

(a) lies above
(b) coincides with
(c) is parallel to
(d) lies below

STATES OF STABILITY

1



STABLE EQUILIBRIUM

The center of gravity (G) must be below the metacenter (M) for a ship to be in stable equilibrium

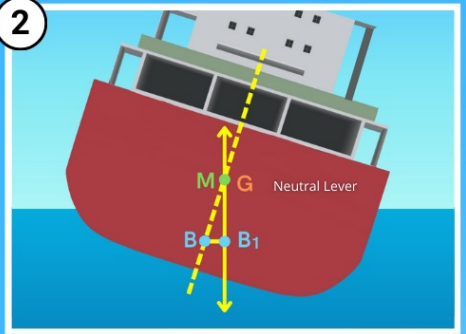
This results in a moment that brings the ship back to its original upright position.

NEUTRAL BUOYANCY

The centre of gravity (G) and the metacentre (M) coincide or nearly coincide.

This causes the ship to heel over to one side and will at that angle of heel i.e angle of loll

2



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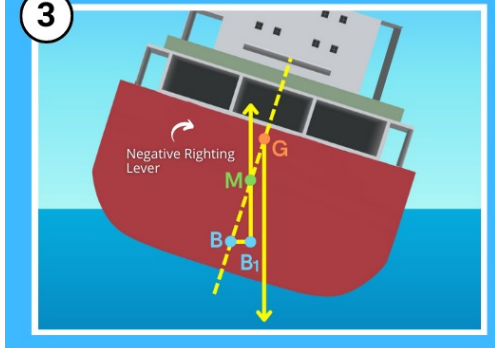


UNSTABLE EQUILIBRIUM

In this state, the centre of gravity (G) is above the metacentre (M).

This is a dangerous state and too much heel would capsize the ship

Q. The upward deflection of a pre-stressed beam with a straight tendon at a uniform eccentricity below the centroidal axis is given by_, where P - effective pre-stressing force, e -eccentricity, L - length of the beam, E - Modulus of elasticity, I - moment of inertia:

(a) $PeL^2/14EI$
(b) $PeL^2/8EI$
(c) $PeL^2/4EI$
(d) $PeL^2/16EI$

The upward deflection of a pre-stressed beam with a straight tendon at a uniform eccentricity below the centroidal axis is given by $\Delta = -\frac{Pe \times \frac{L}{2} \times \frac{L}{4}}{EI} = \frac{PeL^2}{8EI}(\uparrow)$

Q. mutually perpendicular planes are 150 N/mm^2 and 75 N/mm^2. What is the normal stress on the plane inclined at 35° to the axis of the major stresses?

(a) 128.64 N/mm^2
(b) 125.33 N/mm^2
(c) 115 N/mm^2
(d) 120.50 N/mm^2

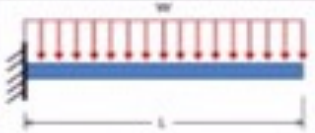
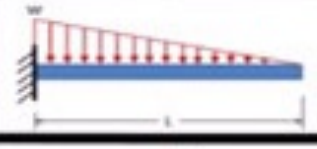
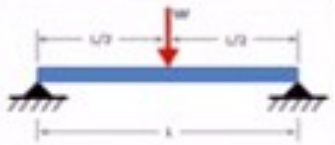
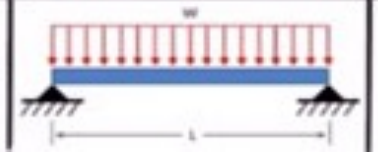
Q. The deflection of the center of the simply supported beam carrying point load at the center is given by:

(a) $-WL^3/48EI$

(b) $-5WL^2/384EI$

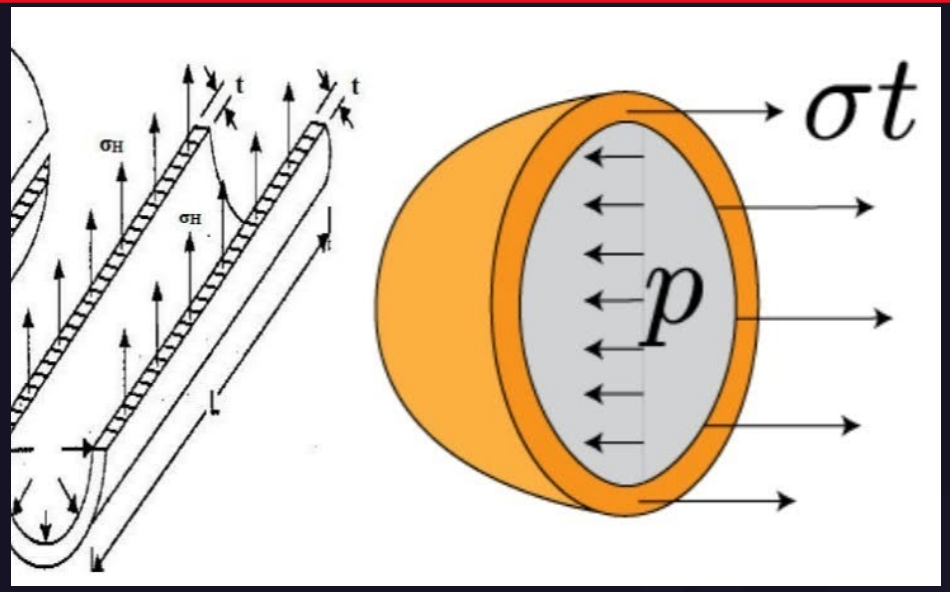
(c) $-WL^2/24EI$

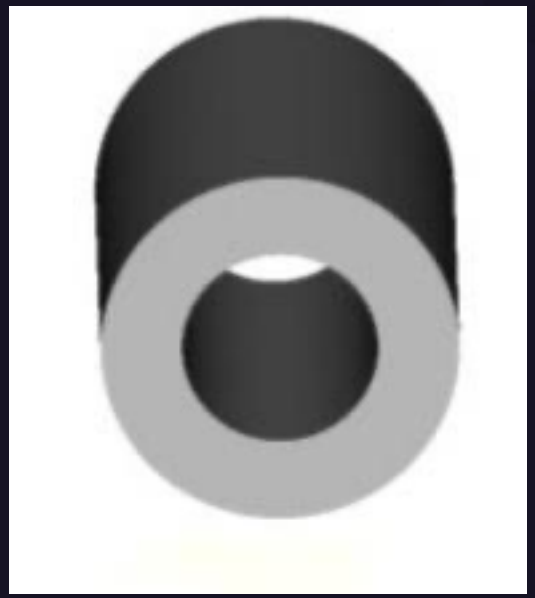
(d) $-WL^3/3EI$

SR. NO.	TYPE OF BEAM	MAX. BM	SLOPE	DEFLECTON
1		M	$\theta = \frac{ML}{EI} = \frac{ML}{EI}$	$\delta = \theta \times \frac{L}{2} = \frac{ML^2}{2EI}$
2		WL	$\theta = \frac{ML}{2EI} = \frac{WL^2}{2EI}$	$\delta = \theta \times \frac{2L}{3} = \frac{WL^3}{3EI}$
3		$\frac{WL^2}{2}$	$\theta = \frac{ML}{3EI} = \frac{WL^3}{6EI}$	$\delta = \theta \times \frac{3L}{4} = \frac{WL^4}{8EI}$
4		$\frac{WL^2}{6}$	$\theta = \frac{ML}{4EI} = \frac{WL^3}{24EI}$	$\delta = \theta \times \frac{4L}{5} = \frac{WL^4}{30EI}$
5		$\frac{WL}{4}$	$\theta = \frac{ML}{4EI} = \frac{WL^2}{16EI}$	$\delta = \theta \times \frac{L}{3} = \frac{WL^3}{48EI}$
6		$\frac{WL^2}{8}$	$\theta = \frac{ML}{3EI} = \frac{WL^3}{24EI}$	$\delta = \theta \times \frac{5L}{16} = \frac{5WL^4}{384EI}$

Q. In the case of a triangular section, the shear stress is maximum at the:

(a) Neutral axis
(b) Height of 2h/3
(c) Height of h/2
(d) Centre of gravity





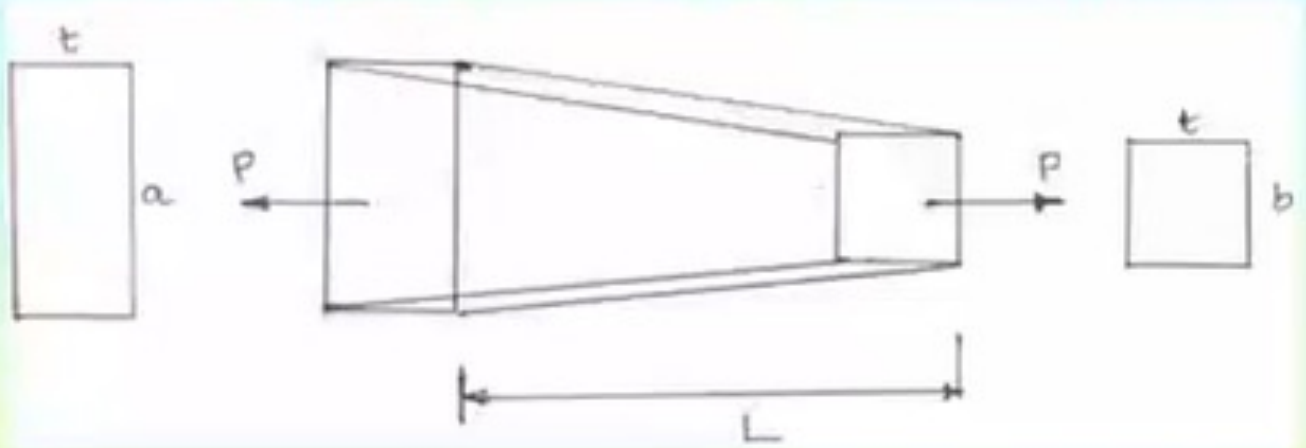
Q. A cylinder is considered to be a 'thin cylinder', if the thickness to internal diameter of the cylindrical shell is:

(a) greater than 1/20
(b) less than 1/10
(c) less than 1/20
(d) greater than 1/10

Q. A rectangular steel bar, which is of 2.8 m long and 15 mm thick, is subjected to an axial tensile load of 40 kN. If width of the bar varies from 75 mm at one end to 30 mm at the end, then what is the extension of the bar if E = 2 x 10^6 N/mm2?

(a) 0.86 mm
(b) 0.36 mm
(c) 0.076 mm
(d) 0.50 mm

For an uniformly tapering rectangular rod subject to tensile load,



the expression for resulting elongation due to the tensile stress is given as,

$$\delta L = \frac{PL}{Et(a-b)} \ln\left(\frac{a}{b}\right)$$

where P = Load applied

L = Length of the rectangular rod

Q. What is the section modulus for a rectangle beam of size 200 mm × 350 mm ?

(a) $4.34 \times 10^6\ mm^3$

(b) $4.08 \times 10^6\ mm^3$

(c) $5.6 \times 10^6\ mm^3$

(d) $5.21 \times 10^6 mm^3$

Q. Elongation of a bar due to its self-weight is Computed by ____ where L- length of the bar, E- Young's modulus of elasticity and W - total weight the bar material.

(a) $WL^2/2AE$
(b) $WL/4AE$
(c) $WL/2AE$
(d) $WL/8AE$

Q. For the clamped- free column, the effective length is equal to:

(a) twice the actual length
(b) 0.5 times the actual length
(c) the actual length
(d) times the actual length

Q. The strain energy stored in a body with sudden load application, the maximum stress induced is twice the stress induced when:

(a) the same load is applied suddenly.
(b) the same load is applied gradually.
(c) he same load is applied by an impact.
(d) the torque of same load is applied.

Q. When does contra flexure point occur on a beam?

(a) When bending moment is maximum.

(b) When bending moment changes its . sign.

(c) When shear force is zero after changing its sign.

(d) When shear force is constant.

Q. In a simple stress-strain test, the volumetric strain is equal to _____ strain.

(a) two times the shear
(b) three times the linear
(c) two times the linear
(d) three times the shear

Q. As per Indian railway standards, the width of the broad gauge is:

(a) 1435 mm
(b) 1524 mm
(c) 1676 mm
(d) 1000 mm

Q. If the capillary rise in soil A with an effective size of 0.02 mm was 60 cm, then what would be the capillary rise in the similar soil B with an effective size of 0.04 mm?

(a) 30 cm
(b) 20 cm
(c) 40 cm
(d) 35 cm

Q. For flow-through soils, the flow is laminar when the Reynold number is:

(a) greater than 2000
(b) less than 2500
(c) greater than unity
(d) less than unity