

Strength of Materials

University of Mumbai

Examinations Summer 2022

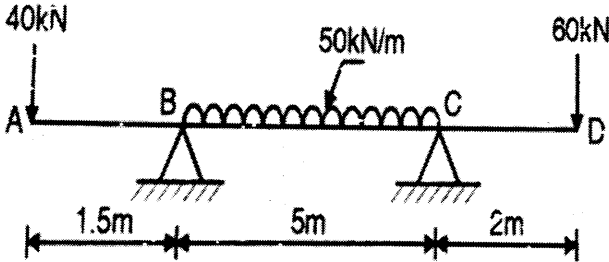
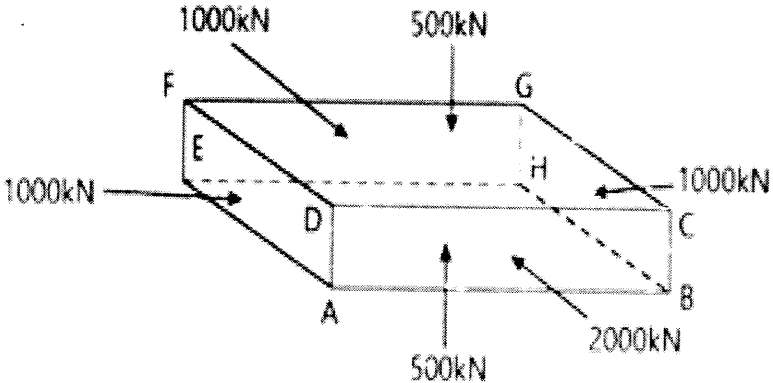
Time: 2 hours 30 minutes

Max. Marks: 80

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	Hooke's law holds good up to
Option A:	yield point
Option B:	limit of proportionality
Option C:	elastic limit
Option D:	plastic limit
2.	If equal and opposite forces applied to a body tend to elongate it, the stress so produced is called
Option A:	internal resistance
Option B:	transverse stress
Option C:	tensile stress
Option D:	compressive stress
3.	If the radius of wire stretched by a load is doubled, then its Young's modulus will be
Option A:	become four times
Option B:	halved
Option C:	doubled
Option D:	remain unaffected
4.	The impact strength of a material is an index of its
Option A:	capability of being cold worked
Option B:	hardness
Option C:	toughness
Option D:	fatigue strength
5.	What is the bending moment at end supports of a simply supported beam?
Option A:	Zero
Option B:	Minimum
Option C:	Maximum
Option D:	Uniform
6.	What is the maximum bending moment for simply supported beam carrying a point load "W" kN at its centre?
Option A:	W kNm
Option B:	$W \times l/4$ kNm
Option C:	$W \times l$ kNm
Option D:	W/m kNm
7.	Maximum shear force in a simply supported beam having a UDL over entire length will be
Option A:	$wL/2$
Option B:	$wL/4$
Option C:	$wL/8$
Option D:	wL
8.	Calculate the Euler's crippling load, if the effective length of column is 10 m take flexural rigidity as 6.14×10^{10} Nmm ² . Consider Both ends hinged.
Option A:	8 kN

Option B:	6 kN
Option C:	10 kN
Option D:	12 kN
9.	A column of length 4m with both ends fixed may be considered as equivalent to a column of length with both ends hinged.
Option A:	2 m
Option B:	1 m
Option C:	3 m
Option D:	6 m
10.	The slenderness ratio is the ratio of
Option A:	Least radius of gyration to length of the column
Option B:	Moment of inertia to area of cross-section
Option C:	Area of cross-section to moment of inertia
Option D:	Length of column to least radius of gyration

Q2	Solve any Two Questions out of Three	10 marks each
A	An unknown weight falls through 8 mm on a collar rigidly attached to the lower end of a vertical bar, 4000 mm long and 40mm * 10 mm in section. If maximum instantaneous extension is 3 mm what is the corresponding stress and value of unknown weight? Take $E = 2 \times 10^5 \text{ N/mm}^2$	
B	Determine the deflection at free end C for the overhanging beam ABC supported and loaded as shown in fig. Take $E = 200 \text{ GPa}$, $I = 13.5 \times 10^{-6} \text{ m}^4$	
C	Find the Euler's crippling load for a hollow cylindrical steel column of 38 mm external diameter and 2.5 mm thick. Take length of the column as 2.3 m and hinged at its both ends. Take $E = 205 \text{ GPa}$. Also determine crippling load by Rankine's formula using constants as 335 MPa and 1/7500	

Q3	Solve any Two Questions out of Three	10 marks each
A	<p>A hollow shaft of diameter ratio $\frac{3}{5}$ is to transmit 250 KW at 70 rpm. The maximum torque = 20 % greater than mean torque. The shear stress is not to exceed 60 MPa and twist in length of 4m is not to exceed 3°. Calculate the external and internal diameters which would satisfy both the above conditions. Take modulus of rigidity $G= 80$ GPa.</p>	
B	<p>A beam 8.5 m long rest on a 5 m apart beam carries the load as shown in the fig. Draw the S.F and B.M diagram and state all the important point including point of contraflexure.</p> 	
C	<p>Compute change in dimensions, change in volume, stress and strain induced in all directions for Figure. Take $\mu=0.3$, $E=210$Gpa, $AB=500$mm, $BC=200$mm and $AE=400$mm</p> 	

Q3	Solve any Two Questions out of Three	10 marks each
A	The stresses at a point of a machine component are 150MPa and 50 MPa both tensile. Find the intensities of normal, shear and resultant stresses on a plane inclined at an angle of 55° with the axis of major tensile stress. Also find the magnitude of the maximum shear stresses in the component.	
B	Two wooden planks $150 \text{ mm} \times 50 \text{ mm}$ each are connected to form a T section of a beam. If a moment of 6.4 kN-m is applied around the horizontal neutral axis, inducing tension below the neutral axis, find the bending stresses at both the extreme fibers of the cross- section.	
C	A cylindrical thin drum 800 mm in diameter and 4 m long is made of 10 mm thick plates. If the drum is subjected to an internal pressure of 2.5 MPa, determine its changes in diameter and length. Take E as 200 GPa and Poisson's ratio as 0.25.	