INSTITUTE OF AERONAUTICAL ENGINEERING
Dundigal, Hyderabad - 500 043

CIVIL ENGINEERING

QUESTION BANK

Course Name	:	**STRENGTH OF MATERIALS - II**
Course Code	:	A40114
Class	:	II-II - B. Tech
Branch	:	CIVIL ENGINEERING
Year	:	2016 – 2017
Course Coordinator	:	Gude Ramakrishna
Course Faculty	:	Gude Ramakrishna

OBJECTIVES

To impart adequate knowledge to find stresses in various structural parts used in buildings, dams, bridges, retaining walls and pressure in vessels, etc. To understand the failure phenomenon and to learn how to prevent the failure. To impart adequate knowledge to continue the design and research activity in structural analysis.

1. Group - A (Short Answer Questions)

S. No	Question	Blooms Taxonomy Level	Program Outcome
UNIT-I **TORSION OF CIRCULAR SHAFTS & SPRINGS**			
1	Define a) Torque b) Torsional moment of resistance c) Polar section modulus d)Proof load e) Proof stress f) Proof resilience	Understanding	a
2	Define Spring constant. Differentiate and explain types of springs.	Understanding	a
3	Derive the equation for power transmitted by a shaft.	Evaluate	a
4	Define spring and mention types of springs.	Understanding	b
5	State functions of springs.	Understanding	b
6	Write torsional equation and explain the terms	Understanding & remembering	a
7	Derive the expression for torque transmitted by a hollow shaft	Evaluate	a

8	Write the Polar Modulus (i) for a solid shaft and (ii) for a hollow shaft.	Remembering	a
9	Why hollow circular shafts are preferred when compared to solid circular shafts?	Analyze	a
10	Write the equation for strain energy stored in a shaft due to torsion.	Remembering	a
UNIT-II **COLUMNS AND STRUTS & BEAMS CURVED IN PLAN**			
1	Define column and effective length of a column. Distinguish between a column and a strut.	Understanding	c
2	Distinguish between short column and long column.	Understanding	c
3	Define slenderness ratio, crippling load.	Understanding	c
4	Explain the Limitations of Euler's Formula?	Understanding	c
5	What are the assumptions made in Euler's theory to arrive at buckling load on column.	Understanding & remembering	c
6	Calculate the slenderness ratio of a strut made from a hollow tube of 20mm outside diameter, 16mm inside diameter and 1.2m long.	Evaluate	c
7	A steel strut is 0.15m diameter and 12m long. It is built in rigidly at bottom but completely unrestrained at the top. Calculate the buckling load taking E=205GPa.	Evaluate	c
8	Write short notes on curved beams and explain its uses.	Understanding & remembering	d
9	What are the types of internal forces that act on a curved beam.	Remembering	d
10	Explain the parameters influencing buckling load of a long column	Understanding & remembering	d
UNIT-III **BEAM COLUMNS & DIRECT AND BENDING STRESSES**			
1	Define beam columns.	understanding	e
2	What is the effect of lateral load on the bucking of columns**?**	understanding	e
3	What is meant by equivalent length of a column?	understanding	e
4	Write the expression for maximum deflection, maximum bending moment and maximum stress of a beam-column simply supported and carrying a UDL of intensity *w* per unit length.	understanding	e
5	Write the expression for maximum deflection, maximum bending moment and maximum stress of a beam-column simply supported at ends and carrying a concentrated load at centre.	Evaluate	e

6	Write short notes on eccentric loading	understanding	e
7	Define retaining wall, earth pressure and types of earth pressure.	understanding	f
8	State the importance of middle third rule in gravity dams.	Understanding & remembering	f
9	Distinguish between active and passive earth pressures.	Understanding & remembering	f
10	Derive an expression for resultant stress of a masonry dam.	Evaluate	f
UNIT-1V **UNSYMMETRICAL BENDING & SHEAR CENTRE**			
1	Define centroid, moment of inertia	understanding	g
2	Write short motes on principal axes. Define product of inertia.	understanding	g
3	Explain parallel axis theorem for product of inertia.	understanding	g
4	Define ellipse of inertia and write equation of ellipse and locus of a point.	understanding	g
5	Write short notes on unsymmetrical bending.	understanding	g
6	Define Flexure or bending axis. Define combined bending and axial loads and write its expression	understanding	g
7	Define shear centre. Write the expressions for shear centre of i) symmetrical sections ii) Equal leg angle sections iii) channel sections	understanding	g
8	Explain unsymmetrical bending	Evaluate	g
9	Explain flexure or bending axis	Evaluate	g
10	Determine the shear centre of symmetrical section shown below.	Evaluate	g
UNIT-V **THIN CYLINDERS & THICK CYLINDERS**			
1	Distinguish between thin cylinder and thick cylinder?	Understanding	h
2	Define hoop and longitudinal stress.	Understanding	h
3	Write the maximum value of shear stress in thin cylinder.	Remembering & Understanding	h
4	What are assumptions made in the analysis of thin cylinders?	Remembering & Understanding	h
5	Define shrinkage allowance.	Understanding	h
6	Write short notes on compound cylinders and their boundary conditions.	Understanding	h
7	Write equations for radial stress and hoops stress as per Lame's theory	Remembering	h
8	Write short notes on lames theory for thick cylinders with assumptions.	Understanding	h
9	What are the different methods of reducing hoop stresses?	Remembering & Understanding	h
10	Derive expression for volumetric strain of cylindrical shells.	Evaluate	h

2. Group - II (Long Answer Questions)

S. No	Question	Blooms Taxonomy Level	Program Outcome
	UNIT-I **TORSION OF CIRCULAR SHAFTS & SPRINGS**		
1	Differentiate and explain types of springs.	Remembering & Understanding	a
2	a) Explain the theory of pure torsion with assumptions. b) Define solid length, spring rate, pitch	analyze	a
3	a)Define spring index (C). (1m) b) Derive the stiffness of springs with sketches when arranged in series & parallel.	creating	a
4	Derive the expression for torque transmitted by a hollow shaft	Apply	b
5	a) Distinguish between close and open helical coil springs b) What is the value (i) maximum shear forces (ii) central deflection in a leaf spring subjected to an axial force? c) Write the equation for the deflection of an open coiled helical spring subjected to an axial load W.	Analyze	b
6	Derive the relation between Twisting moment, Shear stress and angle of twist	Apply	a
7	Derive expression equations for strength and stiffness of a circular shaft when an external torque T is acting on it.	Creating	a
8	Derive expressions for polar modulus for a hollow circular shaft	Analyze	a
9	Derive expression for strain energy for a solid circular shaft	Apply	a
10	Derive expression for strain energy for a hollow circular shaft	Apply	a
	UNIT-II **COLUMNS AND STRUTS & BEAMS CURVED IN PLAN**		
1	Derive the equivalent length of a column whose both ends are hinged using Euler's theory.	apply	c
2	Derive the equivalent length of a column for which one end is fixed and other end hinged using Euler's theory.	evaluate	c
3	Derive the equivalent length of a column for which both ends are fixed using Euler's theory.	creating	c
4	Derive the equivalent length of a column for which one end is fixed and other end is free using Euler's theory.	apply	c
5	Derive Rankine's formula	analyze	c
6	Explain the limitations of Euler's theory	apply	c
7	Derive the maximum and minimum stresses developed in eccentrically loaded long columns	analyze	c

S. No	Question	Blooms Taxonomy Level	Program Outcome
8	Derive the equation for maximum deflection and stresses for a uniformly loaded lateral strut.	analyze	d
9	Derive the maximum bending moment, maximum shear force for a circular beam loaded uniformly and supported on symmetrically placed columns	evaluate	d
10	Derive the maximum bending moment for a semi-circular beam simply supported on three supports spaced equally.	apply	c
	UNIT-III **BEAM COLUMNS & DIRECT AND BENDING STRESSES**		
1	Derive the equation for maximum bending moment of a strut subjected to compressive axial load and a transverse point load at centre and whose both ends are pinned.	Creating &analyze	e
2	Derive the equation for maximum deflection of a strut subjected to compressive axial load and a transverse point load at centre and whose both ends are pinned.	Evaluate	e
3	Derive the equation for maximum stress of a strut subjected to compressive axial load and a transverse point load at centre and whose both ends are pinned.	Evaluate	e
4	Derive the equation for maximum bending moment of a strut subjected to compressive axial load and a transverse point load at centre and whose both ends are fixed.	Analyze	e
5	Derive the equation for maximum deflection of a strut subjected to compressive axial load and a transverse point load at centre and whose both ends are fixed.	Evaluate	e
6	Derive the equation for maximum stress of a strut subjected to compressive axial load and a transverse point load at centre and whose both ends are fixed.	Evaluate	e
7	Derive the resultant stress when a column of rectangular cross-section is subjected to an eccentric load.	Evaluate	f
8	Derive the resultant stress when a column of rectangular cross-section is subjected to a load which is eccentric to both axes.	Remembering &Evaluate	f
9	Explain middle - third rule for rectangular sections	Understanding	f
10	Draw neat sketches of Kernel for the following cross-sections: (a) Rectangular 200mm X 300mm (b) Square with 400cm^2 area (c) Hollow circular cylinder with external diameter 300mm and	Understanding	f

S. No	Question	Blooms Taxonomy Level	Program Outcome
	thickness as 50mm		
UNIT-IV UNSYMMETRICAL BENDING & SHEAR CENTRE			
1	Derive the equation for shear centre of channel section.	Understanding	g
2	Explain the stresses developed due to unsymmetrical bending.	Evaluate	g
3	Derive the deflections of straight beam subjected to unsymmetrical bending.	Evaluate	g
4	Explain briefly about shear centre for symmetrical sections.	Apply	g
5	Derive the resultant shear force, F_R for equal leg angle section.	Evaluate	g
6	Derive the shear centre for channel section	Apply	g
7	Derive shear centre for unequal I-section	Understanding	g
8	Explain Mohr's circle of inertia with a neat sketch	Evaluate	g
9	Explain (a) Principal axes and (b) ellipse of inertia with neat sketches	Evaluate	g
10	Derive transformation laws for moment and product of inertia.	Analyze	g
UNIT-V THIN CYLINDERS & THICK CYLINDERS			
1	Derive the stresses developed in thin cylindrical vessel subjected to internal pressure.	Apply	h
2	Derive expression for longitudinal stress and maximum shear stress developed in thin cylindrical vessel due to internal pressure.	Evaluate	h
3	Derive circumferential strain and longitudinal strain for a thin cylindrical shell subjected to internal pressure	Evaluate	h
4	Derive volumetric strain for a thin cylindrical shell subjected to internal pressure	Evaluate	h
5	Show that when a thin walled spherical vessel of dia 'd' and thickness 't' is subjected to internal fluid pressure 'p', the increase in volume equal to $\frac{\Pi}{8} x \frac{pd^4}{tE}\left(1-\frac{1}{\mu}\right)$	Apply	h
6	Derive the stresses developed in thick cylindrical vessel subjected to internal fluid pressure.	Analyze	h
7	Derive the hoop stress developed in thick cylindrical vessel subjected to internal fluid pressure alone.	Apply	h
8	What do you mean by thick compound cylinders? How will you determine the hoop stresses in a thick compound cylinder?	Apply	h

S. No	Question	Blooms Taxonomy Level	Program Outcome
9	What are the different methods of reducing hoop stress? Explain the terms: wire winding of thin cylinders and shrinking of one cylinder over the another cylinder.	Analyze	h
10	Derive an expression for the radial pressure and hoop stress for thick spherical shell.	Apply	h

3. Group - III (Analytical Questions)

S.No	QUESTIONS	Blooms Taxonomy Level	Program Outcome
	UNIT-I TORSION OF CIRCULAR SHAFTS & SPRINGS		
1	Calculate the maximum stress in a propeller shaft with a 400mm external and 200mm internal diameter, when subjected to a twisting moment of 4650Nm. If the modulus of rigidity, C=82GN/m2, how much is the twist in a length 20 times the diameter?	evaluate	a
2	A closed coil cylindrical spring of circular cross-section has coils with a 75mm mean diameter. When loaded with an axial load of 250N, it is found to extend 160mm and when subjected to a twisting couple of 3Nm, there is an angular rotation of 60 degrees. Determine the poisons ratio for the material.	evaluate	a
3	Determine the diameter of a solid steel shaft which will transmit 112.5kW at 200rpm. Also determine the length of the shaft if the twist must not exceed 1.5^0 over the entire length. The maximum shear stress is limited to 55 N/mm^2. Take G = $8x10^4$ N/mm^2	understanding	a
4	The internal diameter of a hollow shaft is 2/3rd of its external diameter. Compare its resistance to torsion with that of solid shaft of the same weight and material.	Apply	b
5	A hollow shaft of diameter ratio 3/5 is required to transmit 800kW at 110rpm. The maximum torque being 20% greater than the mean. The shear stress is not to exceed 63MPa and the twist in a length of 3m is not to exceed 1.4^0. Calculate the minimum external diameter satisfying theses conditions.	Creating	b
6	A propeller shaft 280mm in diameter transmits 2.5mW at 250rpm. The propeller weighs 50kN and overhangs its support by 400mm. If the propeller thrust is of 123kN weights. Calculate the maximum principal stress induced in the cross-section and indicates its position. C=80MPa	Analyze	a
7	A solid shaft of diameter d is subjected to an axial thrust P and an axial torque of T. Show that the principal stresses at a point on the surface of the shaft is given by $\frac{2P}{\pi d^2}(1 \pm \sqrt{1+\frac{64T^2}{P^2d^2}})$	Evaluate	a
8	Find the mean radius of an open – coiled spring (helix angle is 30^0) to give a vertical displacement and an angular rotation of the loaded end	Analyze	a

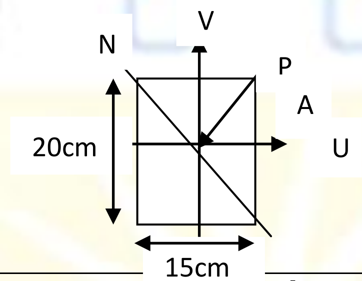
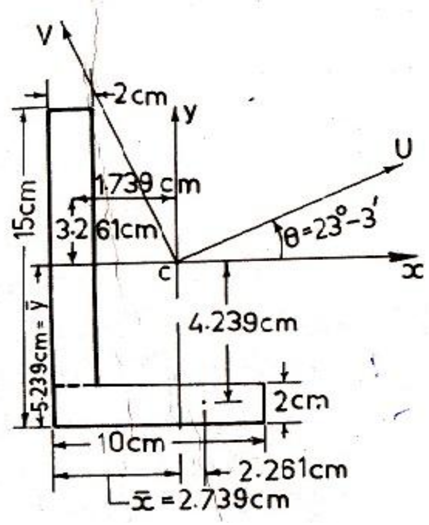
S.No	QUESTIONS	Blooms Taxonomy Level	Program Outcome
	0.02 radian under an axial load 40N. The material available is a steel rod of 6mm diameter. E= 210GPa. C=80GPa		
9	A composite spring has two close –coiled helical spring connected in series, each spring has 12 coils at a mean diameter of 3cms. Find the diameter of the wire in one of the springs if the diameter of wire in other spring is 3mm and the stiffness of the composite is 700N/m.	Evaluate	a
10	In a open coil helical spring having 10 coils, the stresses due to bending and twisting are 98MPa and 105MPa respectively, and the spring is axially loaded. Assuming the mean diameter of the coils to be 8 times the diameter of wire, find the maximum permissible load and the diameter of wire for a maximum extension of 2cm. E=210GPa and G=82GPa.	Analyze	a
UNIT-II COLUMNS AND STRUTS & BEAMS CURVED IN PLAN			
1	A tabular steel strut is 8cm external diameter and 5cm internal diameter, 3m long and has hinged ends. This is subjected to eccentric lad. Find the maximum eccentricity for crippling load of 60% of the Euler's load. The yield stress being 300MPa and E=200GPa.	remembering	c
2	A hollow circular steel strut with its ends position – fixed, has a length of 3m, external diameter of 0.4m and internal diameter 10cm. Before loading, the strut is bent with a maximum deviation of 0.4cm. Assuming the central line to be sinusoidal, determine (a) the maximum stress due to a central compressive end load of 8kN. (B) If the load has an eccentricity of 1.5cm, then find the maximum stress induced. Take E = 200GPa	understanding	c
3	A steel strut of circular cross-section 1.25m long is hinged at both ends. Find the necessary diameter in order that if a thrust of 50kN deviates at the end by $1/10^{th}$ of the diameter from the axis of the strut, the greatest compressive stress shall not exceed 35MPa. If the yield stress of steel 300MPa, find the crippling load. E = 200GPa	remembering	c
4	A steel column is of rectangular cross-section 4cm X 6cm and is having initial curvature given by $y = 0.5x10^{-2} cos\frac{\pi x}{3}$. T carries a compressive load of 20kN at the hinged ends. (a)Find the maximum resultant stress induced on either side of the column. (b) If this load is having an eccentricity of 1.5cm, then also find the stresses. E = 200GPa	understanding	d
5	What is the ratio of strength of a solid steel column of 150mm diameter to that of a hollow circular steel column of the same cross-sectional area and a wall thickness of 15mm? The two columns have the same length and have pinned ends.	apply	c
6	Determine the safe axial load a timber column of cross-sectional area 150mm X 150mm and of 4m length can carry using a factor of safety, 8. Take E = 10kN/mm^2 and for (a)hinged ends (b) fixed ends (c)one end free and other end fixed (d)one end hinged and other end fixed.	remembering	c
7	From the Euler's crushing load for a hollow cylindrical cast iron column, 150mm external diameter and 20mm thick, if it is 6m long and hinged at	apply	c

S.No	QUESTIONS	Blooms Taxonomy Level	Program Outcome
	both ends. Compare this load with that obtained by the Rankines formula using constants 550N/mm^2 and 1/1600. For what length of the column would these two formulae give the same crushing loads? E for the material = 80kN/mm^2		
8	A steel column consists of two channels ISMC 300 X 35.8 kg/m placed back to back at a clear distance of 15cm and two plates of 350mm X 20mm are connected to the flanges. Find the crippling load for the column if the distance between the hinged ends is 8m. Take E = 210kN/mm^2. Properties of channel sections: Area of cross-section of each channel = 45.64cm^2 I_{xx} = 6362.6 cm^4 I_{yy} = 310.8 cm^4 C_{yy} = 2.36 cm Thickness of web = 7.6mm Thickness of flange = 13.6mm	remembering	d
9	A steel strut of circular section is 2m long and hinged at both ends. Find the necessary diameter such that under a thrust of 100kN at an eccentricity of 0.1 of the diameter from the axis of the strut, the maximum compressive stress does not exceed 90kN/mm^2. If the yield tress in compression for steel is 400N/mm^2, find the crippling load of the strut.	apply	d
10	A cast iron column with a 10cm external diameter and 8cm internal diameter is 3m long. Calculate the safe load using Rankine's formula if a) both ends hinged (b) both ends fixed (c) one end free and other end fixed (d) one end hinged and other end fixed. σ_c = 600N/mm^2, α = 1/1600. Adopt factor of safety of 3.	apply	d
UNIT-III BEAM COLUMNS & DIRECT AND BENDING STRESSES			
1	A propeller shaft of 20cm external diameter and 15cm internal diameter has to transmit 1103.25kW at 100rpm. It is additionally subjected to a bending moment of 10kNm and an end thrust of 200kN. Find i) principal stresses and their planes and ii) maximum shear stress and it plane.	Evaluate	e
2	A brick chimney weighs 1600kN and has internal and external diameters at the base are 2m and 3m respectively. The chimney leans by 5⁰ with the vertical. Calculate the maximum stresses in the base. Assume that there is no wind pressure and C.G of chimney is 15m above the base.	Remembering & evaluate	e
3	Determine the maximum stress induced in a cylindrical steel strut of length 1.2m and diameter 30mm. The strut is hinged at both ends and subjected to an axial thrust of 20kN at its ends and a transverse point load of 1.8kN at the centre. E=208GPa.	Evaluate	e
4	Determine the maximum stress induced in a horizontal strut of length 2.5m and of rectangular cross section 40mm wide and 80mm deep when it carries an axial thrust of 100kN and a vertical load of 6kN/m length.	Remembering & evaluate	e

S.No	QUESTIONS	Blooms Taxonomy Level	Program Outcome
	The strut is having pin joints at its ends. E=208GPa.		
5	The line of thrust, in a compression testing specimen 15mm diameter, is parallel to the axis of the specimen but is displaced from it. Calculate the distance of the line of thrust from the axis when the maximum stress is 20% greater than the main stress on a normal section.	Analyse	f
6	A short column of additional diameter 40cm and internal diameter 20cm carries an eccentric load of 80kN. Find the greatest eccentricity which the load can have without producing tension on the cross section.	Evaluate	f
7	A short column of rectangular cross section 80mm X 60mm carries a load of 40kN at a point 20mm from the longer side and 35mm from the shorter side. Determine the maximum compressive and tensile stresses in the section.	Evaluate	f
8	A trapezoidal masonry dam having 4m top width, 8m bottom width and 12m high, is retaining water up to a height of 10m. The density of masonry is 2000kg/ m^3. The coefficient of friction between dam and soil is 0.55. The allowable compressive stress is 343350N/m^2. Check the stability of dams.	Remembering & Evaluate	f
9	A masonry dam of rectangular section, 20m high and 10m wide, as water up to a height of 16m on its one side. Find a) Pressure force due to water and 1m length of dam b) Position of centre of pressure and the point at which the resultant cuts the base. Take weight density of masonry=19.62kN/ m^3 and of water =9.81kN/ m^3. Calculate the maximum and minimum stress intensities at base of dam.	Understanding	f
10	A masonry retaining wall of trapezoidal section is 12m high and retains earth which is level up to the top. The width at the top is 3m and at the bottom is 6m and exposed face is vertical. Find the maximum and minimum intensities of normal stress at the base. Take density of earth=1600kg/m^3 and density of masonry=2300kg/ m^3 and angle of repose of earth=30^0	Evaluate	f

UNIT-IV

UNSYMMETRICAL BENDING & SHEAR CENTRE

S.No	QUESTIONS	Blooms Taxonomy Level	Program Outcome
1	A rectangular beam is 15cm wide and 20cm deep. It is used as a simply supported beam on a span of 6m. Two loads of 5kN each are applied to the beam, each load being 2m from a support. The plane of loads makes an angle of 30^o with the vertical plane of symmetry. Find the direction of neutral axis and maximum bending stresses at Point A as shown in figure below. 	Understanding	g
2	A simply supported beam T-section, 2.5m long carries a central concentrated load inclined at 30^o to the Y-axis. If the maximum compressive and tensile stresses are not to exceed 75MPa respectively find the maximum load the beam can carry.	Apply	g
3	A standard I-beam is bent by equal and opposite couples M acting at the ends of the beam in the plane m-m. Find the maximum stress and the maximum deflection. $I=2400mm^4$, $Iv=150cm^4$, M=5kNm, l=3m, $\phi=30^0$, E= 200GPa	Apply	g
4	Find the moment of inertia of unequal leg angle iron section as shown in figure with respect to axis passing through the centroid. 	Remembering	g
5	A beam is loaded as shown in figure. Determine the maximum deflection and stress at B.	Creating	g

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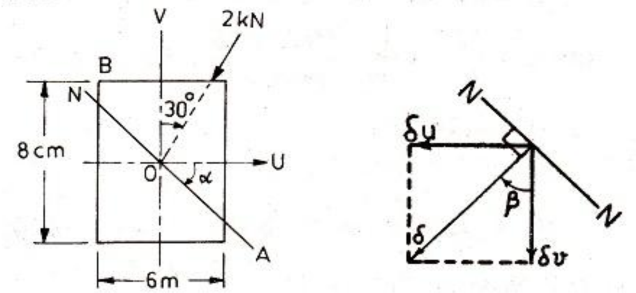
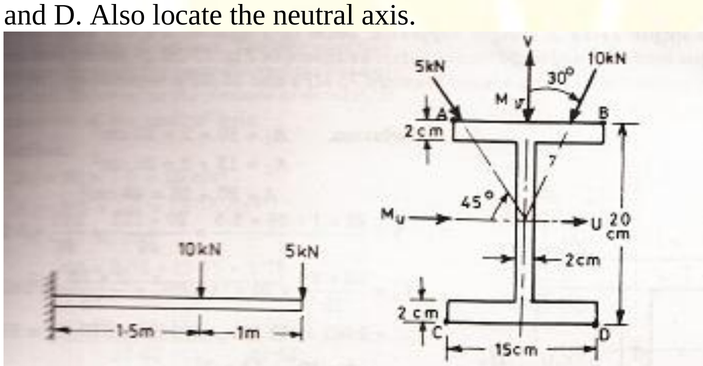
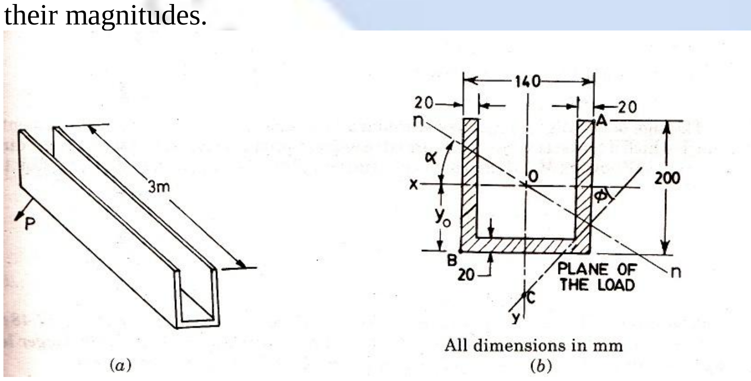
			
6	A cantilever beam of I-section is used to support the loads inclined to the V- axis as shown in figure. Calculate the stresses at the corners A, B, C and D. Also locate the neutral axis. 	remembering	g
7	A cantilever beam has a channel section as shown in the figure. A concentrated load 15kN lies in the plane of the laods making an angle of 60^0 with the X-axis. Load,P lies in the plane of the cross section of the free end of the beam and passes through shear centre,C. Locate points of maximum tensile and compressive stresses in the beam and determine their magnitudes. 	remembering	g
8	A channel section is loaded as shown in the figure. Determine (a) the product of inertia with respect to x and y axes; (b) Shear centre.	remembering	g

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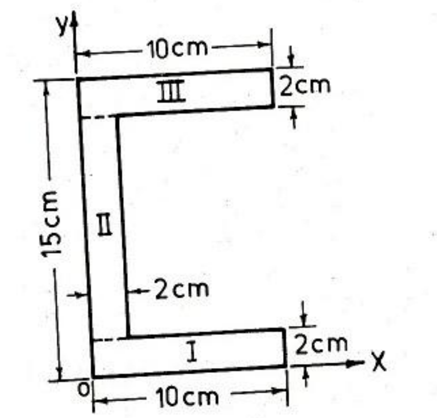
<tr><td></td><td>
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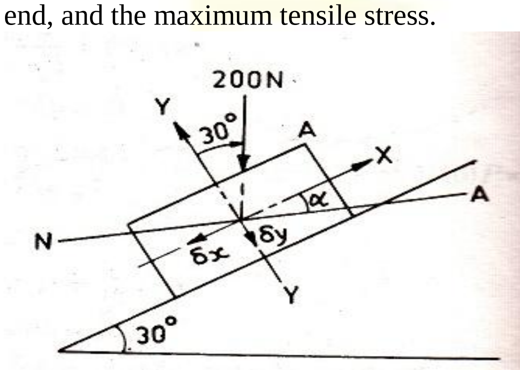
<tr><td>9</td><td>A steel bar of rectangular section 6cm X 4cm is arranged as a cantilever projecting horizontally 50cm beyond the support. The broad face of the bar makes 30^0 with the horizontal. A load of 200N is hung from the free end. Find the neutral axis, the horizontal and vertical deflections of free end, and the maximum tensile stress.

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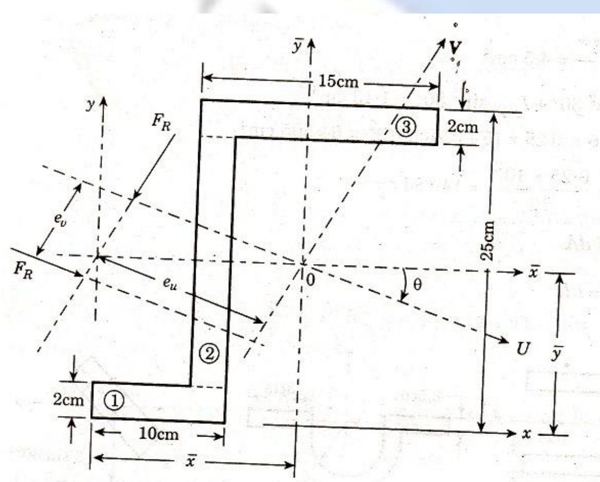
<tr><td>10</td><td>Locate the shear centre of the unsymmetrical section as shown in the figure.

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S.No	QUESTIONS	Blooms Taxonomy Level	Program Outcome
	UNIT-V THIN CYLINDERS & THICK CYLINDERS		
1	A steel water pipe 0.6m in diameter has to resist the pressure due to a head of 120m of water. To what thickness should it e made if the working intensity of pressure in the metal is to be 32N/mm^2. After the pipe has lost 2.5mm of its thickness due to corrosion. Take the specific weight of water to be 10kN/m^3	creating	h
2	Find the circumferential stress at the inner and outer radius respectively in the case of a pipe with a 100mm internal diameter and which is 40mm thick when subjected to an internal pressure of 7.2N/mm^2	remembering	h
3	A thick cylinder of steel having an internal diameter of 100mm and an external diameter of 200mm is subjected to an internal pressure of 56N/mm^2 and an external pressure of 7N/mm^2. Find the maximum hoop stress.	remembering	h
4	A thick cylindrical pipe of outside diameter 300mm and thickness of metal 60mm is subjected to an internal fluid pressure of 40N/mm^2 and an external pressure of 4N/mm^2. Calculate the maximum and minimum intensities of circumferential and radial stresses in the pipe section.	remembering	h
5	A compressed air cylinder for laboratory use ordinarily carries approximately 15 N/mm^2 pressure at the time of delivery. The outside diameter of such a cylinder is 250mm. If the steel has a yield point of 225N/mm^2 and a safety factor of 25. Calculate the required wall thickness.	apply	h
6	A cast iron pipe having an internal diameter of 30cm has wall 6mm thick and is closely wound with a single layer of steel wire 3mm diameter under a stress of 8MN/m^2.Calculate the stresses in pipe and the wire when the internal pressure in the pipe is 1MPa.	remembering	h
7	A cylindrical steel vessel with hemispherical ends is 60cm long over all, the outside diameter is 10cm and the thickness 5mm throughout. Calculate the change in internal volume of the vessel when it is subjected to an internal pressure of 15MPa. E=200GPa and υ = 0.28	Apply	h
8	A copper tube of inside diameter 6cm and outside diameter 6.5cm is closely wound with steel wire of diameter 1mm. Find the tension at which the wire must be wound on the tube if a pressure of 1.5MPa is required before the copper is subjected to tensile stresses, the tube being free to expand or contract axially. For copper, E_c=10GPa, υ=0.3, and for steel, E_s=200GPa	evaluate	h
9	A cylindrical pressure vessel with closed ends is 25cm external diameter and 5mm thick. It is wound closely with a single layer of circular section steel wire of 1.2mm diameter under tension of 96MN/m^2. If the cylinder is treated as thin, calculate the (a) initial stress in cylinder, (b) initial pressure which will produce a stress of 48MN/m^2, and (c) stress in the wire under these conditions. Poisson's ratio = 0.30	Understand	h
10	A cast iron pipe having an internal diameter of 30cm has wall 6mm thick and is closely wound with a single layer of steel wire 3mm diameter	apply	h

S.No	QUESTIONS	Blooms Taxonomy Level	Program Outcome
	under a stress of $8MN/m^2$. Calculate the stresses in the pipe and the wire when the internal pressure in the pipe is 1MPa. E_s = 200GPa and E_{CI} = 100GPa		