

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (special), January 2016

B. Tech, Civil Engineering, Semester III

Roll No.....

CE-305: Structure Analysis - I

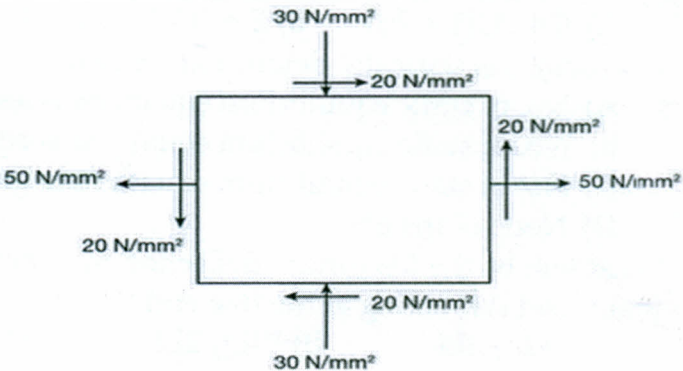
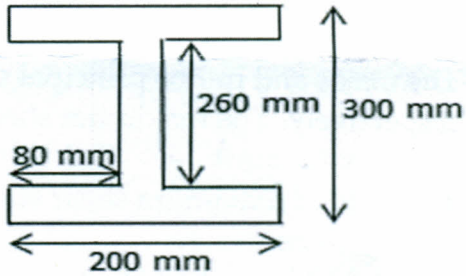
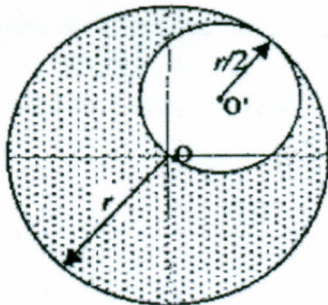
Time: 3 hours

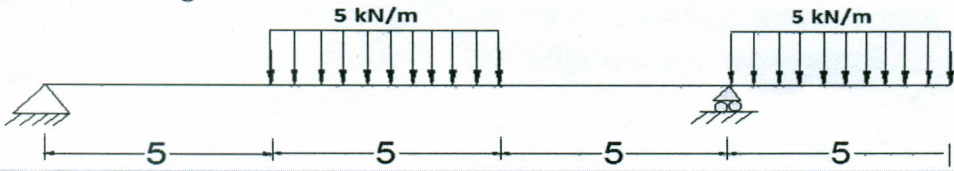
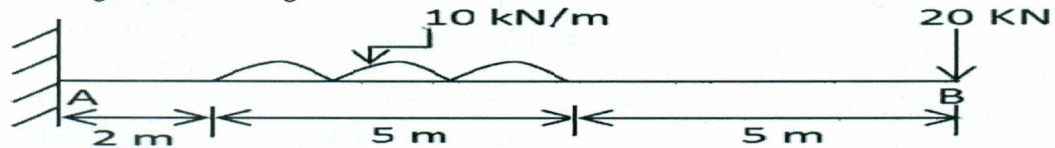
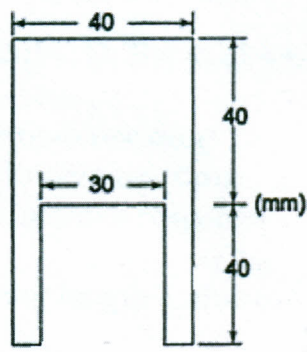
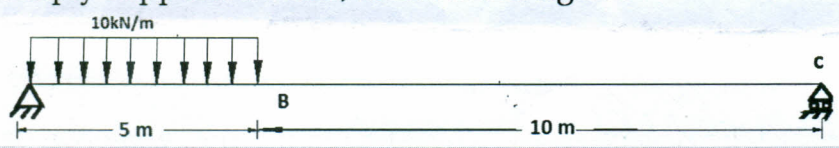
Max. Marks: 100

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.

Q.1A	Objective type multiple choice questions (10 questions @ 1 mark)	10
i.	Moment of inertia is defined as - A) $\int Y dA$ B) $\int A dY$ C) $\int Y^2 dA$ D) $\int A^2 dY$	
ii.	If principal stresses in a two-dimensional case are - 10MPa and 20MPa respectively, then maximum shear stress at the point is A) 10MPa B) 15MPa C) 20MPa D) 30MPa	
iii.	The relationship between Young's modulus of elasticity E, modulus of rigidity G and Poisson's ratio 'u' is given by A) $E = 2G(1 + 2u)$ B) $E = 2G(1 + u)$ C) $E = 3G(1 + 2u)$ D) $E = 3G(1 + u)$	
iv.	A structure is statically determinate when- A) No. of static equilibrium equations is less than unknown reactions B) No. of static equilibrium equations is equal than unknown reactions C) No. of static equilibrium equations is greater than unknown reactions D) None of the above	
v.	What will be the Maximum deflection in a cantilever beam of length L, due to point load (W) acting at the free end: A) $WL^3/2EI$ B) $WL^4/2EI$ C) $WL^3/3EI$ D) $WL^3/2EI$	
vi.	The variation of the bending moment in the portion of a beam carrying uniformly distributed load is A) Linear B) Parabolic C) Cubic D) Constant	
vii.	The major and minor principal stresses at a point are 3 MPa and -3 MPa respectively. The maximum shear stress at the point is A) 0 N/mm ² B) 3 N/mm ² C) 6 N/mm ² D) 9 N/mm ²	
viii.	The ratio of maximum shear stress and the average shear stress for a rectangular beam will be: A) 3/2 B) 4/3 C) 2/3 D) 3/4	
ix.	If the length of a simply supported beam carrying a uniformly distributed load at the center is doubled, the slope at the center will become A) two times B) four times C) Eight times D) sixteen times	
x.	A shaft transmits 1.5 MW of mechanical power at 1500 rpm. Torque required is- A) 9.35 kNm B) 9.55 kNm C) 9.65 kNm D) 9.25 kNm	

Q.2	Short answer type questions (4 questions @ 2.5 marks)	10
i.	A simply supported beam have a point load (P) at the distance 'a' from left support and distance 'b' from right support. What will be the maximum bending moment in the beam?	
ii.	Derive the expression of volumetric strain in terms of stresses in x, y, z directions and poisson's ratio.	
iii.	Calculate the elongation in the bar of uniform cross sectional area, having length L and weight W, due to self weight.	
iv.	The principal tensile stresses at a point across two mutually perpendicular planes are 120 N/mm^2 and 60 N/mm^2 . Determine the normal and tangential stresses on a plane inclined at 40° to the axis of the minor principal stress.	
Q.3A	Derive the relation between load intensity, shear force and bending moment.	05
Q.3B	Prove that: $E = \frac{9GK}{(3K+G)}$ Where E & G are modulus of elasticity and rigidity respectively and K is bulk modulus of elasticity.	10
Q.4A	Drive the expression of the direct stress and shear stress at a plain inclined at an angle θ from vertical axis in an element under direct tensile stress (σ_x) condition.	05
Q.4B	Determine the direction of principal plane of the stressed material as shown in figure. Also calculate normal stresses and tangential stresses at principal plane.	05
		
Q.5	Find the center of gravity (CG), in both X and Y direction, of the section shown below. Also calculate the moment of inertia (I_{xx} & I_{yy}) about axis passing through CG.	10
		
	-OR-	
Q.5	Find the center of gravity (CG), in both X and Y direction, of the section shown below. Also calculate the moment of inertia (I_{xx} & I_{yy}) about axis passing through CG.	10
		

Q.6	A overhang beam is loaded as shown in Fig. Write the Equations of Shear Force and Bending Moment for Beam. Also, Draw the Shear Force and Bending Moment Diagram. All the dimensions are in meter.	10
		
OR		
Q.6	A cantilever is loaded with the loading shown in Figure. Draw the Shear Force and Bending Moment Diagram for the cantilever beam.	10
		
Q.7	What must be the length of a 5 mm diameter aluminium wire so that it can be twisted through one complete revolution without exceeding a shearing stress of 42 MN/m ² ? Take $G = 27 \text{ GN/m}^2$.	05
OR		
Q.7	A mild steel shaft has to transmit 75 kW at 200 rpm. Taking allowable shear stress as 70 MN/m ² . Find the suitable diameter for the shaft, if the maximum torque is 1.3 times mean torque.	05
Q.8	Derive the expressions of shear stress and bending stress at any point in the given section. Also draw the bending stress and shear stress diagram. Modulus of Elasticity = E, Bending Moment = M, Shear Force = V.	10
		
Q.9A	Using Macaulay's Method, Determine the Deflection and slope at mid span of a simply supported beam, as shown in figure.	10
		
Q.9B	Using Conjugate Beam Method, Determine the Deflection and slope at mid span of a simply supported beam, as shown in figure.	10
