

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

EndTerm Examination (Regular), November 2016

B. Tech. in Civil Engineering, Semester III

Roll No.....

CE 305: Structural 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.	If the shear force along a section of a beam is zero, the bending moment at the section is 1. zero 2. average of maximum-minimum 3. maximum 4. minimum	
ii.	The shape of the bending moment diagram over the length of a beam, having no external load, is always 1. cubical 2. parabolic 3. linear 4. circular	
iii.	The maximum twisting moment a shaft can resist, is the product of the permissible shear stress and 1. moment of inertia 2. polar moment of inertia 3. Modulus of rigidity. 4. polar modulus	
iv.	The shape of the bending moment diagram over the length of a beam, carrying a uniformly distributed load is always 1. circular 2. parabolic 3. cubical 4. linear	

v.	For a simply supported beam with a central load, the bending moment is	
	1. maximum at the supports 2. least at the centre 3. least at the supports 4. Maximum at the centre.	
vi.	Young's modulus is defined as the ratio of	
	(A) Volumetric stress and volumetric strain	
	(B) Lateral stress and lateral strain	
	(C) Longitudinal stress and longitudinal strain	
	(D) Shear stress to shear strain	
vii.	Principal planes are planes having	
	(A) Maximum shear stress	
	(B) No shear stress	
	(C) Minimum shear stress	
	(D) None of the above	
viii.	The maximum bending moment due to a moving load on a simply supported beam, occurs	
	1. at the supports 2. at the mid span 3. under the load 4. anywhere on the beam	
ix.	A beam is said to be of uniform strength, if	
	1. bending stress is same throughout the beam 2. B.M. is same throughout the beam 3. shear stress is same throughout the beam 4. deflection is same throughout the beam	
x.	The law which states, "within elastic limits strain produced is proportional to the stress producing it", is known as	
	1. Bernoulli's law 2. Stress law 3. Hooke's law 4. Poisson's law	

Q.2	Short answer type questions:	10
A.	Define the following terms:	03
	a) Stress	
	b) Shear Stress	
	c) Tensile force	
	d) Elastic Limit	
	e) Hook's Law	
	f) Compressive force	
B.	Define principal stress and principal planes.	02
C.	Write slope deflection formula for the following: (each que@1 Marks)	05

- A. Cantilever beam with concentrated load W at the free end
- B. Cantilever beam carrying a concentrated load W at distance L_1 from fixed support
- C. Cantilever beam subjected to UDL over entire span
- D. Simply supported beam subjected to point load at mid span
- E. Simply supported beam subjected to UDL over entire span

Q.3	A steel bar of 20mm diameter is loaded as shown in Figure 1. Determine the stresses in each part and the total elongation. Take $E = 210 \text{ GPa}$.	15
Q.4	A surveyors steel tape 30 m long has a cross section of 15 mm X 0.75mm; Line AB is measured as 150m. If the force applied during measurement is 100N more than the force applied at the time of calibration, what is the actual length of line?	15
Q.5	A hollow circular shaft of 6 m length and inner and diameters of 75 mm and 100 mm is subjected to torque of 10 KN-m. If $G = 80 \text{ GPa}$, determine the maximum shear stress produced and the total angle of twist.	15
Q.6	A cantilever beam 12 cm wide and 20 cm deep is 2.5 m long. What UDL the beam carry to produce a deflection of 0.5m cm at the free end and what concentrated load at free end would produce the same deflection? Give the slope at the free end in both cases. Ignore self weight of beam. Take $E = 2 \times 10^5 \text{ N/mm}^2$.	20
OR		
Q.6	A cantilever beam AB 6 m long is subjected to UDL of ' W ' KN/m spread over the entire length. Assume rectangular cross section with depth equal to twice the width. Determine the minimum dimension of the beam so that the vertical deflection at the free end does not exceed 1.5 cm and the maximum stress due to bending does not exceed 10 KN/cm ² . Take $E = 2 \times 10^7 \text{ N/cm}^2$.	20
Q.7	A rectangular column of 240 mm X 150 mm is subjected to a vertical loads of 10 KN placed at an eccentricity of 60 mm is a plane bisecting 150 mm side. Determine stress intensities in the section.	15

Figure 1.

