

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular), April-May 2015

B. Tech. in Civil Engineering, Semester IV



Roll No.....

CE405 : Structural Analysis - II

Time: 3 hours

Max. Marks: 100

Instructions to students:

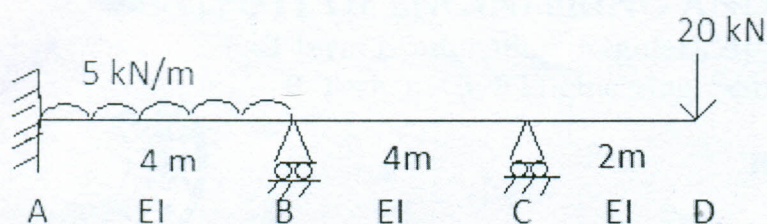
1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.

Q.1A Objective type multiple choice questions (10 questions @ 1 mark) 10

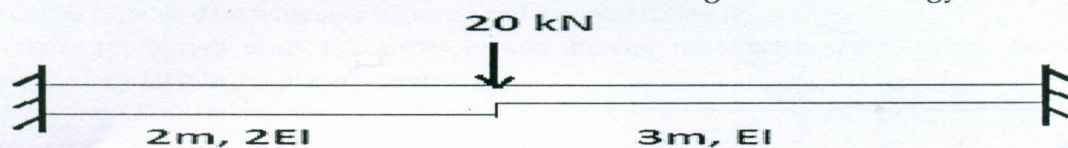
- i. A cylinder is said to be thin if the ratio of its thickness & diameter, is less than
A. $1/25$ B. $1/20$ C. $1/15$ D. $1/10$
- ii. n and j are numbers of members and joints in a frame. It contains redundant members if
A. $n = 2j - 3$ B. $n < 2j - 3$ C. $n > 2j - 3$ D. all of the above
- iii. A closely coiled helical spring of radius R , contains n turns and is subjected to an axial load W . If the radius of the coil wire is r and modulus of rigidity of the coil material is C , the deflection of the coil is
A. $\frac{WR^3n}{Cr^4}$ B. $\frac{2WR^3n}{Cr^4}$ C. $\frac{3WR^3n}{Cr^4}$ D. $\frac{4WR^3n}{Cr^4}$
- iv. If p is the internal pressure in a thin cylinder of diameter d and thickness t , the developed hoop stress, is
A. $\frac{pd}{2t}$ B. $\frac{pd}{4t}$ C. $\frac{pd}{t}$ D. $\frac{2pd}{t}$
- v. Two springs having stiffness $2N/mm$ and $3N/mm$ are connected in series. A 3rd spring having stiffness $4N/mm$ is connected parallel to both springs. What will be the equivalent stiffness of the system -
A. $26/5$ B. $20/9$ C. $12/13$ D. 9
- vi. Effective length of a long column fixed at one end and free at far end is
A. $L/2$ B. $2L$ C. L D. $\sqrt{2}L$
- vii. The width of the analogous column in the method of column analogy is
A. $2/EI$ B. $1/EI$ C. EI D. $EI/2$
- viii. The slenderness ratio is the ratio of
A. Length of column to least radius of gyration
B. Moment of inertia to area of cross-section
C. Area of cross-section to moment of inertia
D. Least radius of gyration to length of the column
- ix. In a curved beam, the distance between neutral axis and centroid axis is
A. $\frac{Rh^2}{R^2+h^2}$ B. $\frac{R^2h}{R^2+h^2}$ C. $\frac{R^2h^2}{R^2+h^2}$ D. $\frac{Rh}{R^2+h^2}$

x.	Small initial curvature beams will be defined as A. $R > 5D$ B. $R < 5D$ C. $R < 2D$ D. $R < 4D$	
Q.2	Short answer type questions (4 questions @ 2.5 marks)	10
i.	Calculate the length of the column for which Euler's theory and Rankine's theory gives the same buckling load for same support condition.	
ii.	State the difference between closely coiled and open coiled helical spring.	
iii.	What are the types of column failure? Explain briefly.	
iv.	A water main 80 cm in diameter contains water at pressure head of 100m. if the weight of water is 10 kN/m^3 , find the thickness of the metal required for the water main. Take permissible stress as 20 MPa.	
Q.3A	Write the assumption made in the analysis of curved beams.	05
Q.3B	Derive the expression of the total stresses in a circular ring having force P acting on the ends of a diagonal.	05
Q.4A	Calculate the value of h^2 for a T section.	05
Q.4B	A spherical shell of inner diameter 1 m and thickness 10 mm is subjected to an internal pressure of 1.5 N/mm^2 . Determine the increase in diameter and the increase in volume. Take $E = 200,000 \text{ N/mm}^2$ and poisson's ratio (μ) = 0.3	05
Q.5A	A thin cylindrical shell of 1.2 m in diameter and 3 m length has a metal thickness of 12 mm. it is subjected to an internal fluid pressure of 3.2 MPa. Find the circumferential and the longitudinal stresses in the wall. Determine the change in the length, diameter and volume of the cylinder. Assume $E = 210 \text{ GPa}$ and poisson's ratio (μ) = 0.3	10
	OR	
Q.5B	A composite spring has two closely coiled helical steel springs connected in series, each spring has 12 coils at a mean diameter of 3 cm. find the diameter of the wire in one of the springs if the diameter of the wire in outer spring is 3mm and the stiffness of the composite spring is 720 N/m. Estimate the greatest load that can be carried by the composite spring and the corresponding extension for a maximum shearing stress of 190 MPa. $G = 80 \text{ GPa}$.	10
Q.6A	Two steel columns have same length and weight. One is a solid and other is hollow with internal diameter three forth ($3/4$) th of external diameter. Compare the ratio of strengths of the solid steel strut to that of the hollow one.	05
Q.6B	Derive the expression of buckling load using Euler's theory for a long column, fixed at one end and free at another.	05
	OR	
Q.6B	A cast iron column of hollow cylindrical section 5 m long, with both ends fixed, has to carry an axial load of 300 kN. Determine the section, using a factor of safety of 8. Internal diameter to be 0.8 of the external diameter. Rankine's constants for Cast Iron are $f_c = 550 \text{ N/mm}^2$; $\alpha = 1/1600$	05

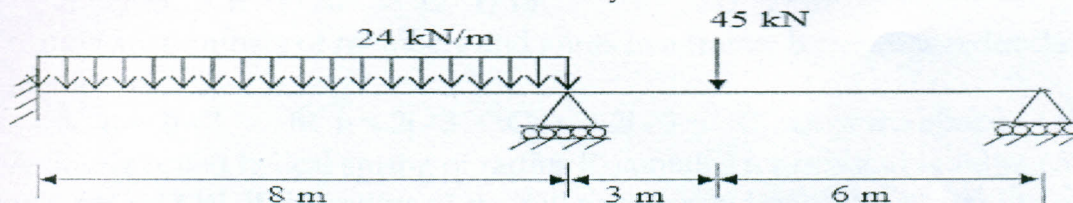
- Q.7 Calculate the fixed end moment of the beam shown in figure below using force method of analysis. 15



- Q.8A A beam of 5 m having the section properties and loadings as shown in figure. Calculate the fixed end moment of the beam using column analogy method. 15



- Q.8B Calculate the support reaction and fixed end moment of the beam shown below. Use three moment theorem for analysis. $EI = \text{constant}$ 10



OR

- Q.8B Draw the SFD and BMD of the beam shown in the figure below. Use three moment theorem for analysis. $EI = \text{constant}$. 10

