

College of Engineering, Pune

End-Semester Examination

SY. B. Tech. (Civil)

(CE 203 – Strength of Materials)

Date:- 27/11/2011

Maximum Marks: 50

Time: - 08:00 am to 11:00 am

Duration : - 3 hr.

Instructions:

1. All questions are compulsory.
2. Marks of each question are indicated against it.
3. Assume suitable data wherever applicable and mention it clearly.
4. Use of mobile phones is strictly prohibited in the exam hall.

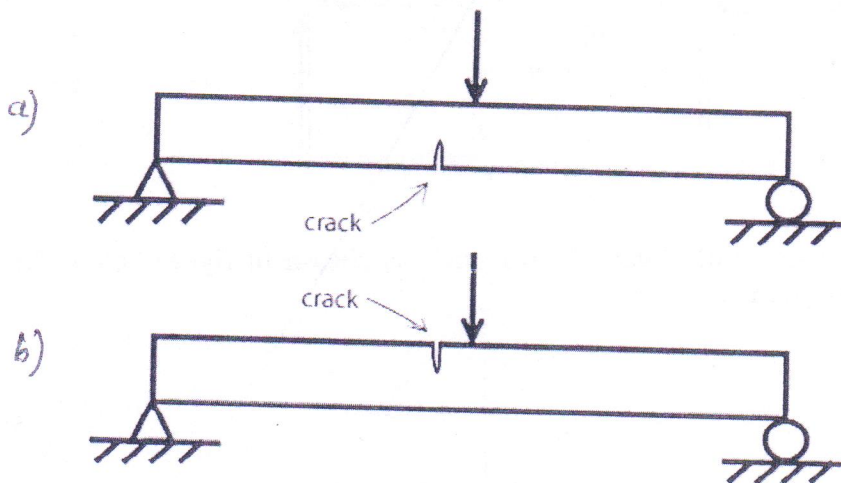
Q.1 Select the correct option for the following questions.

(07)

1. When the two columns of same length, same cross sectional dimensions are subjected to purely axial load, but one is made from high grade steel and second is made from mild steel, then,

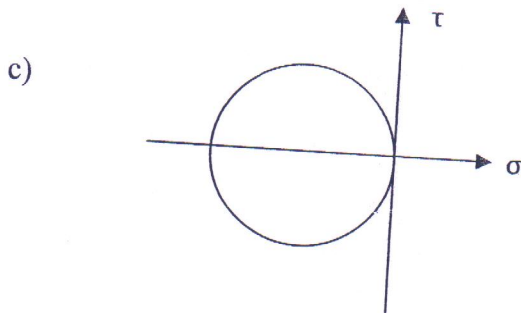
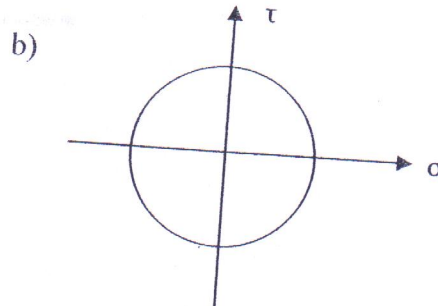
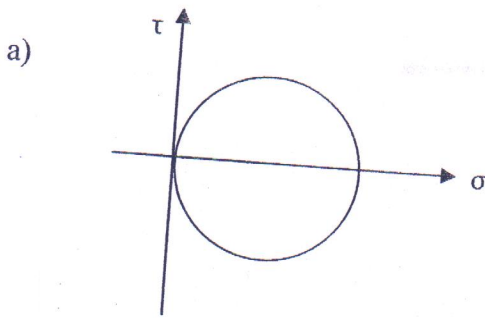
- a) Tor steel column will buckle at higher load
- b) Mild steel column will buckle at higher load
- c) Both will buckle at same load

2. A beam is loaded in the middle, which beam will fail at the smaller load.



- c) Both beams will fail at the same load.

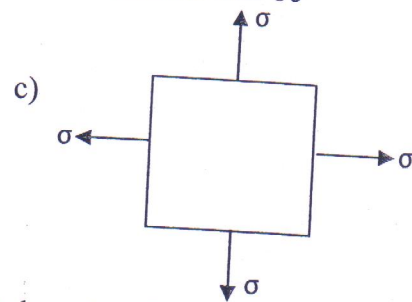
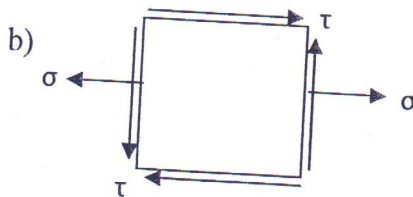
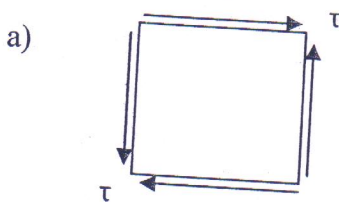
3. Which one of the following Mohr's circle represents the state of pure shear.



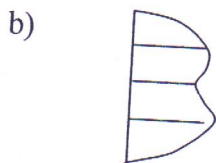
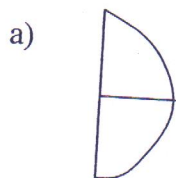
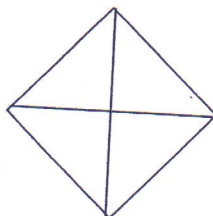
4. In the Euler's formula for buckling load, $P_{cr} = n \frac{\pi^2 EI}{l^2}$ the value of factor n is least in case of a column with

- a) Both ends fixed
- b) One end fixed and other free
- c) One end fixed and other hinged

5. For which one of the following two-dimensional state of stress the Mohr's circle will be represented by a point.



6. For a square beam with diagonal horizontal as shown in figure below the shear stress distribution diagram is



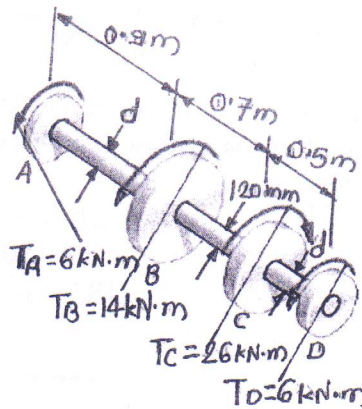
7. For any structural material, the value of Poisson's ratio is always

(a) greater than 1

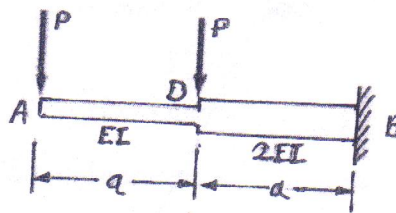
(b) between 0.5 and 1

(c) between 0 and 0.5

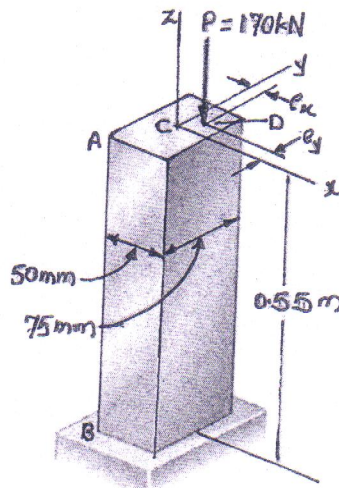
Q.2 Shaft BC is hollow with inner and outer diameters of 90 mm and 120 mm, respectively. Shafts AB and CD are solid and of diameter d . For the loading shown in figure below, determine a) the maximum and minimum shearing stress in shaft BC b) the required diameter d of shafts AB and CD if the allowable shearing stress in these shafts is 65 MPa. (06)



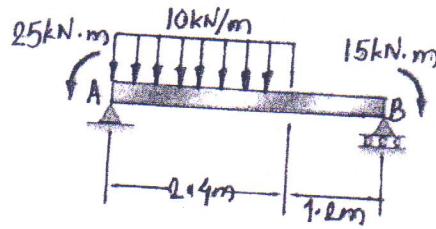
Q.3 State and explain moment-area methods two theorems. And hence determine slope and deflection at the free end of the cantilever beam shown in figure below. (08)



Q.4 For the column shown in figure below determine the stresses acting along corner AB. Also draw stress distribution diagrams along short and long cross sectional faces. If $e_x = 6\text{ mm}$ and $e_y = 10\text{ mm}$. (07)



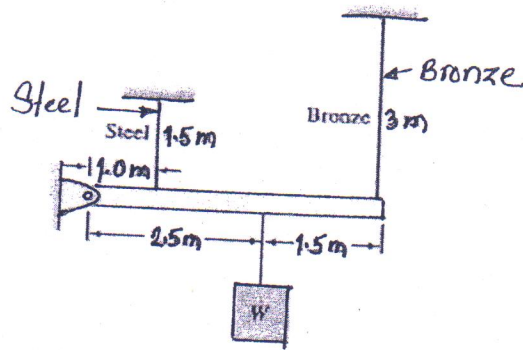
Q.5 Draw the shear force and bending-moment diagrams for the beam as shown in figure below. Also draw shear stress and bending stress distribution diagrams if the beam is of rectangular cross section of $80 \text{ mm} \times 300 \text{ mm}$. (08)



Q.6 The rigid bar of negligible weight is supported as shown in the figure below. If $W = 80 \text{ kN}$, compute the temperature change of the assembly that will cause a tensile stress of 50 MPa in the steel rod. Use the following data.

	A (mm^2)	α ($1/^\circ\text{C}$)	E (GPa)
Steel rod	300	11.7×10^{-6}	200
Bronze rod	1400	18.9×10^{-6}	83

(06)



Q.7 Derive the Expression for critical load of a column hinged at both ends, by specifying the limitations of Euler's theory. (08)