B. Tech. Sem - III (Mechanical Engg.) (2014 COURSE) (CBCS) :
SUMMER - 2019
SUBJECT: SOLID MECHANICS

Day: Saturday
Date: 11/05/2019

Time: 02.30 PM TO 05.30 PM
Max Marks: 60

S-2019-2576

N.B.:

1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.
3) Only half imperial size drawing sheets should be used.
4) Assume suitable data if necessary.

Q.1 **a)** Explain the following terms: **(10)**
- i) Bulk Modulus
- ii) Shear Modulus
- iii) Poisson's Ratio

OR

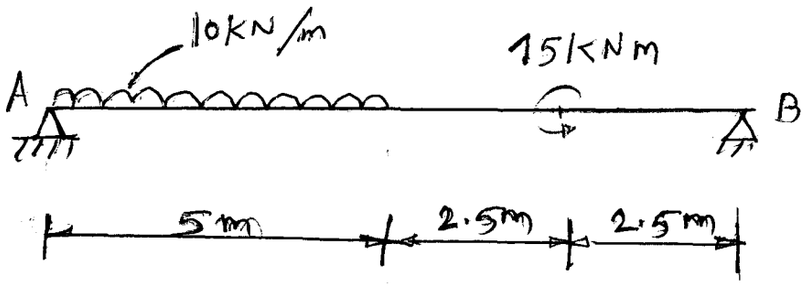
b) A steel tie rod 40 mm. in diameter and 2 m long is subjected to a pull of 80 KN. To what length the bar should be bored centrally so that the total extension will increase by 20% under the same the same pull, the bore being 20mm in diameter take E= 2X 10^5 Nmm^2 **(10)**

Q.2 **a)** Direct stresses of 160 N/mm^2 tensile and 120 N/mm^2 compressive exist on two perpendicular planes at a certain point in a body. They are also accompanied by shear stresses on the planes. The greatest principal stress at the point due to there is 200 N/mm^2 **(10)**
- i) What must be magnitude of shearing stresses on the two planes.
- ii) What will be the maximum shearing stress at the point.

OR

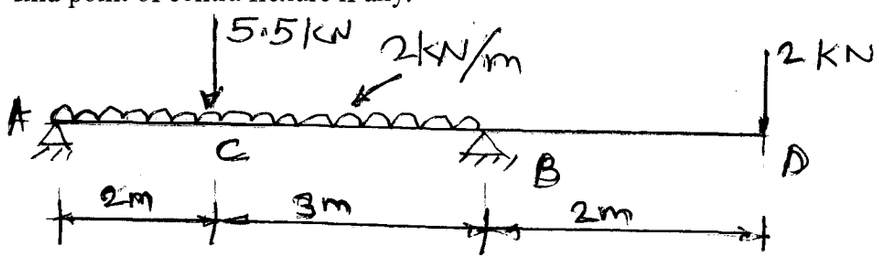
b) A bolt is under an axial pull of 8 KN together with a transverse shear force of 3 KN calculate its diameter according to **(10)**
- i) Maximum principal stress theory
- ii) Maximum shear stress theory
- iii) Maximum strain theory

Q.3 **a)** Draw shear force and bending moment diagrams for the beam of shown in **(10)**



OR

b) Draw S.F and B.M diagrams for the loaded beam as shown in figure also find point of contra flexure if any. **(10)**



P.T.O.

Q.4 **a)** A solid circular shaft transmits 75 KW power at 200r.p.m. Calculate the shaft diameter, if the twist in the shaft is not to exceed 10 in 2 meters length of shaft and shear stress is limited to 50 MN/m^2 Take C= 100 GN/m^2. **(10)**

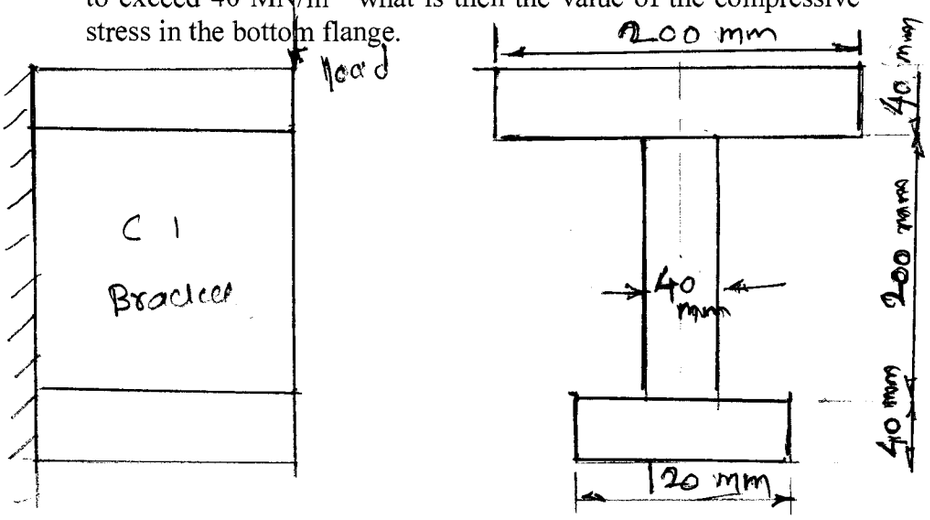
OR

b) Derive differential equation for deflection. **(10)**

Q.5 **a)** Fig shows a cast iron bracket of cross section of I- form. Find **(10)**

i) Position of Neutral axis and the moment of inertia of the section about the neutral axis.

ii) Determine the maximum bending moment that should be imposed on this section if the tensile stress in the top flange is not to exceed 40 MN/m^2 what is then the value of the compressive stress in the bottom flange.



OR

b) Three planks each 50 mm X 200 mm are arranged to form an I section the section in subjected to a shear force of 14 KN. Suggests an alternative rectangular section of the same material so that the same maximum shearing stress is produced due to the same shear force. The width of the reaction section shall be two third of the depth. **(10)**

Q.6 **a)** A beam of circular cross section of diameter 12 mm has it's centre line curved to radius 60 mm. find the intensity of maximum stress in the beam when it is subjected to a moment of 45 KN –mm **(10)**

OR

b) Explain in detail design procedure for knuckle joint with neat sketch. **(10)**

* * * * *